JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

Legislative Schemes and Work.

THERE has been a sudden stoppage of legislative proceedings at Westminster, just when in former days activity was greatest. There has always been a desire to get through as much as possible of the Public and Private Bill work before the Easter recess, while members are eager to negotiate it, and before holidays—for members of Parliament have only the common attributes of humanity—begin to intervene, and have an allaying effect on eagerness and willingness. We are now close upon Easter, and (though the Church festival falls late) the public measures of first importance, owing to their highly contentious character, have not made much headway. But Private Bill work, owing to its poverty and, generally speaking, unassuming and non-contentious nature, is moving along the channels of fate with a fine display of alacrity. The comparative calm of this progress has, however, for the past fortnight enveloped this side of legislative proceedings with depressing dulness; and on the side of public business, the powerful hostility that has been provoked throughout the country by the revolutionary schemes of the Government has caused such enervation in the Lower House that there was, though the cause is greatly regretted, quite a manifestation of relief at the beginning of last week at a temporary escape. The retirement of Sir Henry Campbell-Bannerman from the Premiership, through impaired health, naturally produced an interruption of public business; and the Houses adjourned probably ten days before they would otherwise have done, and only reassemble this week for the transaction of formal business, after which there will be a postponement of all legislative work until after the Easter recess.

But the, at this time of the year, abnormal hiatus in this regard covers a period teeming with importance to the public weal. The ministerial cards have been reshuffled; and there will have to be an appeal in certain centres (the seats of two new Cabinet Ministers and of two who have been elevated to the House of Lords) to the constituencies concerned. This will give additional opportunity for a pronouncement from the electors of their feelings regarding certain malignant measures now before the country. The period, too, will afford a further opportunity for fostering and consolidating opposition against the measures ere they again come before the House. The Government are already uneasy and irritated over the immense commanding power of the interests they find in antagonism to them, and which interests are adopting methods that are quite constitutional and very effective, but which have not hitherto had application in political action, for enlarging their opposition forces. Take, for example, the Coal Mines (Eight Hours) Bill. The agitation that has been stimulated against this uncalled-for and harmful measure has been followed to detail in these pages in view of its seriousness to the large coal-consuming gas industry in common with all other industries. The agitation is being, and can be further, spread by the administrations of gas undertakings. As we are writing, there opportunely comes to hand a note that the Directors of certain Gas Companies supplying south of the Thames addressed to their shareholders, asking them to sign a letter directed to their local members of Parliament. Prominence is given here to this form of letter, as we think it will be suggestively useful. Vacant lines are left for the address of the sender. A blank space is also provided for the name of the member of Parliament; and the letter is addressed to the House of Commons, Westminster. Then the communication reads—

> DEAR SIR,—As a private consumer of coal, as well as a gas consumer and a shareholder in a Gas Company, I shall be seriously affected by the Coal Mines (Eight Hours) Bill if it should become law. There appears to be no doubt whatever that the effect of the enactment of this Bill would be to add very materially to the cost of coal, which is at present very high, and would consequently increase the price of gas, thereby injuring the community in general without conferring any counterbalancing benefit upon the miner. As one of your constituents, I sincerely hope that you will oppose the Bill in Parliament.—Yours faithfully,

A widespread adoption of this idea by the managements of gas undertakings would be an effective way of impressing on members of Parliament the interest of the gas industry in, and its feeling on, this momentous question.

Regarding the ministerial changes that the retirement of Sir Henry Campbell-Bannerman occasions. The statutory undertakings—company and municipal—forming a great part of the gas-supply industry, have fairly big dealings with the Board of Trade and the Local Government Board; and interest in the Home Office has also lately been revived by the fact that the Minister in charge of the Mines (Eight Hours) Bill is the Home Secretary. In the reconstruction of the Cabinet following the retirement of Sir Henry, it was expected there would be changes in the heads of the three departments named. Political considerations apart, it must be conceded that Mr. Lloyd-George as President of the Board of Trade has been an unqualified success; and Mr. John Burns, as President of the Local Government Board, has shown a business acumen and grip of the details of the work of his important department that has won for him the admiration of even those who are among his political adversaries. There is no doubt about a conscientious effort having been made on the part of both right honourable gentlemen to hold, in the ordinary business affairs of their departments, a fairly even balance. In the event, the only change that has been made, as the country learned yesterday, in the departments referred to has been the accession of Mr. Winston Churchill to the Presidency of the Board of Trade, on the promotion of Mr. Lloyd-George to the office of Chancellor of the Exchequer. If Mr. Churchill is inspired by an ambition to do the right equal to that of his predecessor, there will be little, if any, occasion for legitimate complaint on the part of those who happen to have business relations with the department.

The dislocation of parliamentary work caused by the retirement of the Prime Minister, brought to a dead-end the proceedings on Private Bills in the Committee rooms, though both Houses, by resolution, gave their Select Committees power to continue work until the formal adjournment for Easter, notwithstanding the suspension of the larger parliamentary affairs of the session. But, as a matter of fact, most of the Committees had reached the bottoms of the lists of Bills entrusted to their scrutiny and investigation; and, with the exception of the Police and Sanitary Committee (who continued for a day or two to tackle the Widnes Corporation Bill), those who had further Bills to consider took advantage of the option, and escaped from Westminster. It was a complete collapse; and dreary indeed was the Committee corridor for a couple of days with only the Police and Sanitary Committee sitting. The dull conditions generally of Private Bill Legislation has lately been the common talk of habitues of the Committee rooms, as their footsteps have resounded along the almost deserted corridors. A dozen years and more have passed since the equal of the barrenness of the present session can be found. The immediate preceding sessions have been bad quantitatively, but they have had measures superior in quality, and giving much greater scope for conflict. If we include railway, canal, tramway, gas, water, electricity and harbour and tidal water Bills, there were this session 124 that survived the preliminary formalities, and faced the parliamentary stages for good or ill; while last session there were 136. Both of these are low figures in comparison with previous sessions. People have been asking among themselves, why we are suffering this period of sterility in this respect; and one perceptive student of the situation puts his finger on four reasons. There is, first, the present financial condition of the country; secondly, the

extreme difficulty of promoters in interesting the public in new enterprises; thirdly, the railway companies have been, through municipal competition, labour troubles, and growing expenses, badly hit of late, and they have but little inducement to put forward new schemes at the present time; and, fourthly, the general feeling of unrest and of insecurity that has been created in the minds of promoters and investors by the socialistic and revolutionary character of some of the present Government proposals.

We firmly believe that this last legislative-contracting cause has more to do with the shrinkage of Private Bill Legislation than is generally recognized. Of this there is no doubt, that the socialistic and revolutionary influences have permeated to the Committee rooms, and have been felt by company promoters of legislation—more, perhaps, in the first two sessions of this Parliament than in the present one, when bitter opposition to public measures has caused a feeling of uneasiness that things have already gone too far, and with an abruptness for which the country was not prepared. Still it is like penetrating into unknown regions to introduce at the present time a Bill into Parliament; for the matured Act in its cardinal features has often now little similarity to the measure in its inchoate stage. All sorts of proposals are suddenly empaled, and substitutes found or their places left empty. But with the reason as to unrest and insecurity are combined others for a deficiency in the amount of legislation so far as the gas industry is concerned. If we look at the capital expenditure of most gas undertakings on works and plant (omitting that on meters, cookers, and fittings), it is seen that it is decreasing considerably per unit of output; and this is largely due to those benefactors of the industry who, by improvement, have enabled the production of a greater volume of gas from each ton of coal handled than in former days, and a much greater volume of gas on a given area of ground. That is one factor influencing delay in going to Parliament for an extension of powers; and another is the reduction of the rate of increase in consumption (excepting in places that have of late been enjoying an extraordinary expansion in building and population) owing to the saving-power, and the increasing saving-power, of the incandescent gas-burner. Still, in numbers of promotions, the gas industry does not stand at all badly in relation to other industries, although this year there were only fourteen Company measures (excluding the stillborn one of the Coalite Company) and nine municipal "Omnibus" Bills containing clauses relating to gas. The gas industry has made its contribution; and, such as it is, it reflects well the character of the measures in other departments of Private Bill Legislation. However, as wide asunder as the poles is the character of the private measures generally and that of the public measures promoted by the Government—the former being of small importance, and raising (if any) little more than personal or parochial opposition; while the latter are moving the great majority of the thinking and sober-minded men of the country to active rebellion. The future of public legislative work at Westminster is shrouded in impenetrable gloom; but the fruits of that work may have a weighty bearing on the prosperity of a country that already feels the impeding effects of the load of Imperial and local demand.

The Validity of the Dessau Vertical Retort Patent.

From a translation appearing in another column, it will be seen that, on the petition of Herr Auguste Klönne, whose name has been so long associated with the development of the construction of retort-settings on the regenerative principle, the question of the validity of the German patent for the Dessau (or Bueb) vertical retort system has been before the Nullity Court of the German Imperial Patent Office; and the patentees have succeeded in upholding their patent. It may be said at once that we are glad of this success, and cordially congratulate upon it those who have so persistently laboured to make the system of practical utility. Though in connection with this vertical retort question, an independence of judgment has been maintained in these columns, and there has been no hesitation at criticism in the matter of comparative results, we have not been blind to merit, to assiduity, to success where success had not been achieved before, and to the inestimable contribution that the workers at Dessau and in Berlin have made to previously existing knowledge of the principles underlying and the problems encompassing the carbonization of coal for the production of gas. That contribution to knowledge alone represents a definite advance, and has given fresh thought to all whose interests are concentrated in the carbonization of coal for the production of gas and marketable residuals. Those who have given us this knowledge deserve all the reward they will get from their particular combination, just as others who may, without an appropriation of the Dessau combination as a whole, supersede it in result, will merit all they can realize in competition with the German or any other system. We will not be parties to anything in the shape of robbery of a period's legitimate reward.

The results of the Dessau system do not concern us on the present occasion, but merely the rights of those who have succeeded where nobody had succeeded before. Of what does their system consist? Merely of the combination of a number of simple and well-known principles, which had never been put into similar combination before for gas-manufacturing purposes. This being an incontrovertible fact, another fact naturally ensues; and it is that the effects of the combination could not, therefore, have been known, nor were they known, or in certain respects suspected. But take the details of the structure of the system, there is not a single one that could of itself be claimed as positively new; but, we repeat in order to emphasize, there has never, before the Dessau system, been any combination of those several parts making a practicable whole for the primary purpose of gas making. By this combination, results have been attained certain of which have never been attained before in high-temperature carbonization of coal for gas making; and the combination realizing those results has permitted the application of what are claimed to be two new principles—the absence of a free space in the retorts, and the subjection of the retorts to a higher temperature than has heretofore been usual. In the union of these two principles, the patented Dessau process consists. With regard to the first, the most minute research to the early days of gas making does not reveal a single instance in all gas-works carbonization practice in which a free space above the charge of coal has not been regarded as an indispensable condition, and, in fact, has been an essential in horizontal and ordinary inclined retorts. This Mr. Thomas Glover also made clear in his excellent paper on the "Retorting or "Carbonization of Coal" before the Institution of Gas Engineers in 1906. Opinions may differ as to the value or otherwise of a small and constant amount of free space not too highly heated and the total absence of such a free space; but the fact remains that, before Dessau, results such as the workers there have achieved were not attained in the absence of a free space above the charge of coal. But with regard to the high temperatures employed in the Dessau system, the patentees are not so strong on this as on the first principle, though they claim the right to the combination of the two. True it is that the temperatures applied in the Dessau system are not common in gas-works practice; but there is no law that can prevent anyone engaged in coal carbonization raising (even, as a *cause célèbre* once suggested, to the fusion-point of the material composing the settings) or dropping their temperatures as they desire. In fact, in their pleadings, the patentees candidly admit "that temperatures "as high as those mentioned in their patent have formerly "occasionally been reached in coal gas manufacture."

The surprising thing is why Herr Klönne went to this trouble to try to get the Dessau patent annulled. There is not the slightest sympathy with those who submit that with the vertical retort there are not other structural and working combinations that will realize equivalent effects. We do not think that Herr Klönne would like his action construed into an admission that his inventive resources have come to a dead-stop, or into an acknowledgment that his well-considered opinion is that Dessau marks finality so far as the vertical retort is concerned. But his action really is open to both constructions. Instead of making the first move in an attempt to overthrow the patent of those who have directed the way, why not take the vertical retort (for which no patentable rights exist), and endeavour to produce an independent combination that shall excel in result the Dessau setting? That would have fallen better within the range of our appreciation than a direct attack with the view to expropriating the results of the Dessau workers—results obtained from an enormous expenditure of money, time, thought, and labour. Take as an example the inverted burner. The bunsen burner like the vertical retort was well known before the original patent for a practical inverted burner was taken out. But the direction in which the bunsen burner shall be used is a matter of common choice. The validity of the

original patent for a practical inverted burner, which is held by the New Inverted Incandescent Gas-Lamp Company, has never been contested in this country; but the Courts, to the Court of Appeal, have held that burners (using inverted bunsens, but varying in other features) in respect of which actions have been brought by the owners of that patent have not been infringements. Notwithstanding, it may be incidentally mentioned, the course of prosperity of the New Inverted Company has not been disturbed. Therefore, any combination in which the vertical retort is the central part that possesses, in structure and mode of working, features distinct from that of the Dessau, or is its superior in result, would stand in no danger in this country; and this is said without in any way wishing it to be understood that in the remark there is a deducible opinion that the Dessau patent would stand an attack in respect of validity in the Law Courts of this country.

The weakest part of Herr Klönne's case was undoubtedly the assault he made on the advantages ascribed to the Dessau retort. His contention was that they were all well known before. We repeat deliberately that they had not been attained before in any vertical retort system developed specially for the production of coal gas, nor had certain of them been achieved before in horizontal and inclined retorts in conjunction with the use of high temperatures. Very strongly do we feel on the question of deprivation of credit and reward where credit and reward are due. On one incidental point, the statement conveying the decision of the Court is undoubtedly at fault. It is said that "the knowledge that "naphthalene is the result of superheating the gas in the "retort was new when the patent was applied for." As the patent which it was sought to annul was only applied for in 1903, the Court were under some misapprehension in this regard. However, this is a small point; but, concerning the principal one, we reiterate our pleasure that the Court upheld the patented rights in the system, regarded by itself and as an unprecedented combination.

Woodall-Duckham Continuous Carbonizing System

THE installations of the Woodall-Duckham system of continuous carbonization hitherto in operation have been on a comparatively small scale; the largest having been eight retorts in two settings of fours. They have, however, been sufficiently large to show increased yields of gas of good quality per ton of coal, reduction in the quantity of naphthalene, increase in ammonia, thinner tar, and low labour costs; and the possibility of further improvement in fuel and labour expenses when larger installations were made. Such installations are now promised at the Kensal Green works of the Gaslight and Coke Company and at the Burnley Corporation Gas-Works. A long report, full of interest, has been made on the subject of carbonizing in vertical retorts by the Chairman and Vice-Chairman of the Burnley Gas Committee, in conjunction with the Gas Engineer (Mr. J. P. Leather). There has been no hurry over the matter, seeing that the inquiry and personal inspection these gentlemen have made have extended over quite twelve months. Their report may therefore be taken, from the time point of view, to be the result of particular consideration; and confident are we that the recommendation with which the report concludes would not have been made without Mr. Leather had entirely satisfied himself on all points of technical detail. It will be seen, by reference to extracts from the report printed elsewhere in this issue, that the Committee and their Engineer have been impressed by the simplicity of the mechanical charging arrangements of the Woodall-Duckham system, by the absence of smoke and dirt, by the fact that the men working the plant are not exposed to heat and fumes, and by the results generally.

In connection with the original installations of the system, most, if not all, engineers regard the method of taking away the coke from the bottom of the retorts by means of a conveyor, through a water seal, as a source of weakness, and moreover a cumbersome method. The view of other engineers in this respect is that of Mr. Leather; and the fact that the inventors have entirely discarded the discredited, or rather the distrusted, mode of working, shows that they, too, after experience were not enamoured of it. Their new coke-removing device (which has already been described in our columns, both in conjunction with the Liverpool meeting of the Manchester Institution and in our "Register of Patents," and now again in the Burnley report) is a much simplified method. Put briefly, the principle of the revolving drum charging arrangement has been applied at the discharging end; and we believe that all who have had an opportunity of inspecting its operation at the Poole works of the Bournemouth Gas and Water Company speak of it in terms of high commendation. The Burnley report is no exception. As the discharging difficulty has now been so satisfactorily surmounted, the continuous system of carbonizing stands as a practical method for the acceptance of gas-works.

The Burnley Gas Committee are contemplating the erection of a bench containing 36 retorts. The Poole setting, under test, has shown a carbonizing capacity of 64 cwt. of coal per retort per day; so that, if we take the round figure of 3 tons a day for each of the 36 retorts, their total daily carbonizing capacity will (if the projected installation is made) come out somewhere in the region of 108 tons, with a gas production of about 1,400,000 cubic feet. Mr. Leather spoke on the subject of vertical retorts at the meeting of the Institution of Gas Engineers in 1906; and the remarks then made will be found of interest in connection with this proposal to adopt at his works one of the most modern forms of carbonizing plant.

Parliament the Tool.

IT has been urged in these columns again and again that Parliament should exercise greater care than they have hitherto done—except in the case of the Mid-Oxfordshire Gaslight and Coke Company—in inquiring into Bills for statutory powers for new concerns, in order to prevent themselves being made the tool of City promoters. These promoters have succeeded more than once before this in getting parliamentary powers, and afterwards using them for extracting money from the public for concerns that are likely to be shackled for ever with a capital out of all proportion to necessity and the possible business. Parliament is again responsible for giving assistance to certain City promoters in launching on the public an undertaking whose prospects —with the heavy capital proposed and the rural nature of the area which it is intended to supply with water—are of the most shadowy. The fact that it is a water and not a gas company is not a bar to its use as an illustration in this part of the "JOURNAL." The Selsey Water-Works Company is the title of the concern; and for it an Act of Parliament was obtained last session, although the Hon. J. D. Fitzgerald, K.C., did his best to open the eyes of a Committee of the House of Lords to the character of those behind the promotion. Without any mincing of words, he described the promoters as "men of straw;" and he also stated that one of the persons named in the Bill was a caretaker of an office in the City, and the other two were clerks employed in a City office. These interesting persons combined supplied an ægis for the real promoters, who have a record for promotions of which we, at all events, are not particularly envious. The valuable aid that Parliament rendered these promoters is shown by the prospectus, and particularly by the abridged version published in the daily papers.

The big-print heading to the latter is "The Selsey Water "Act, 1907;" and in the prospectus itself, the Act and the parliamentary powers that it conferred are made the utmost use of, for the purpose of wheedling a considerable sum of money from the public for an insignificant concern. In the abridged prospectus, as published in the daily papers, the only Director's name given is that of the Chairman, Alderman John O. Holt, J.P., who is this year Mayor of Chichester and the Chairman of the Corporation Water Committee. We are sorry to see him associated with this Company; and it is hoped that his name will not be at all successful as a decoy. If we turn to the full prospectus, it is found that the three other Directors—Luther Clayton, Edwin R. Painter, and W. B. Martin—are all members of the Board of the Petersfield and Selsey Gas Company, one of the examples of the much over-capitalized progeny of the same City coterie of promoters. W. B. Martin, too, is, or was, a Director of the Laindon and District Gaslight and Coke and Water Company, the prospectus of which contained statements as to parliamentary powers that could not be said to be strictly in accordance with truth. Some independent inquiry should be made, before investing in the Selsey Company, regarding the success or otherwise of the Petersfield concern. When the Selsey Bill was first deposited, its object was to take in gas as well as water and the public. But there was some disturbance of amicable feeling between the promoters and the disappointed shareholders of the Petersfield and Selsey Gas Company; and

the gas part of the Bill had to be dropped. But three of the Directors of the Petersfield and Selsey Company evidently have no scruples against being identified with the Selsey Water Company; and we see that two of them are also associated with a concern working out its destiny as the Selsey Development Company.

The prospectus of this Selsey Water Company has been circulated among the shareholders of gas companies in the neighbourhood. But, if they know Selsey, they will smile hugely when they come to read one of the paragraphs in the inveigling letter accompanying the prospectus. Writes the Secretary: "There being no possible substitute for water, I "venture to suggest that shares in a water company such "as this, having parliamentary powers, offer a sound invest-"ment, not being liable, as in the case of gas companies' "shares, to fluctuation in value, owing to the possible rise in "the price of coal and electric light competition." We venture to suggest, in opposition to the Secretary, that shares in this Company will be a very unsound investment. Parliament authorized a capital of £20,000—three parts share, and one part debenture. Of the total, the Company are already asking the public to subscribe no less than £12,000. What for? Such water as is wanted is going to be supplied in bulk by the Chichester Corporation at 6d. per 1000 gallons. There are therefore no water-works to build—only a distribution system to lay down in undeveloped Selsey and the neighbourhood, to connect which with civilization there is a kind of tramway running to a point near Chichester Railway Station. Looking into the prospectus, it is seen there are other purposes, besides the water-distribution system, for which money is required. The cost of obtaining the Act is to be provided for, the expense of making the present issue has to be met, and money is needed for "other outlays." Under these various objects, what part of the £12,000 will be handled (if obtained from the public) by the original promoters who were, according to the Hon. J. D. Fitzgerald, K.C., hiding behind "men of straw?" Depend upon it that something will have to go seriously wrong if the advantage to them is not greater than to the shareholders. Those who are wise will ask themselves what prospect is there within any measurable distance of time of making in Selsey, from water, costing, delivered in bulk, 6d. per 1000 gallons, *plus* distribution and other working and managerial charges, a profit sufficient to pay fair dividends on £12,000? We hope there will be but few who will be tempted to sink and lose money in the pastoral district of Selsey by the facts that Parliament have again made themselves the tool of company promoters, that Alderman Holt, the Mayor of Chichester, is the Chairman of the Board of Directors of the Company, and that Barclay and Co. are the Bankers.

Gas Coal and a Waiting Policy.

There is no doubt that prices for coal have hardened for the past month—probably partly owing to the introduction of the Mines (Eight Hours) Bill, and partly to the continuance of cold weather so far into the spring. Several coal buyers from abroad, too, who do not understand the political situation in this country, have rushed in, and made purchases that we firmly believe they will find could have been advantageously deferred. These things have helped to somewhat stiffen prices; but in regard to them there should be a word of warning. Everything points to the fact that, though there may be a little temporary price-hardening, trade and general conditions cannot now support the coal market in extravagant quotations; and therefore, from the most obvious points of consideration, it seems clear that no one should go into the market at the present time unless old contracts have run out, and then only so far as may be absolutely essential. There need not be the slightest fear that all the coal that is wanted will not be available. Another word of warning is necessary. It is that too much reliance should not be placed on reports from coal centres. We have not a word to say against the *bona fides* of newspaper coal trade correspondents; but it is only natural their reports should be tinted somewhat with the views of those with whom they come in contact. Those with whom the market reporters rub shoulders are the sellers, and not the buyers; and they are, of course, largely dependent on the former for their "inspiration" and "rumours." The position is such that the simple meeting of requirements, rather than rushing into the market and so helping to factitiously bolster up prices, is the best policy.

The Signification of Coal Export Statistics.

Reference has been made to the export trade; and it may be urged that too much significance should not be placed upon the returns as to the total shipments of coal of the past three months. There has been an increase in the period of about 480,000 tons; but the *rate of increase* shows a great decline upon that of 1907 over 1906. This is an indication of the course of events. With reference to gas coal alone, the figures as to exports show an increase of 382,853 tons for the three months; but more than half of this has reference to March. In considering these figures, it must be remembered that a not inconsiderable amount of it is represented by contracts made last year when there was such a rush from abroad to cover requirements; and some of it is also due to misunderstanding by buyers abroad as to the effects of the Eight Hours Bill. While there is every probability that this measure, if passed, will permanently increase the price of coal, that is not to say the increase will be upon the abnormally high prices of the present, but upon prices that will, as usual, rise and fall with the demand, shaped by the circumstances of trade, or by other temporary extraordinary conditions.

Justices and Rating.

The High Court of Justice has now conclusively declined to interfere with the sitting of Justices in the hearing of rating appeals, no matter whether they are representative of the owners or whether they are indirectly concerned in the question by membership of other Assessment Committees. The sitting of Justices covered by the latter part of this statement was challenged in the High Courts by the South Metropolitan Gas Company; the sitting of those covered by the former part of the statement, by the Assessment Committee of the Hendon Union. We alluded on March 31 (p. 816) to the attack the latter made on Justices of the Middlesex Bench who are also members of the Middlesex County Council (including Sir Ralph Littler, the Chairman of the Middlesex Quarter Sessions). The Committee went to the Courts, seeking a rule *nisi* for a prohibition to prevent Justices who are members of the County Council adjudicating in an appeal by the Metropolitan Electric Tramways Company, Limited, against the rating of their undertaking; the contentions, being that as the Company are in occupation as lessees of tramways owned by the County Council, members of the County Council have a direct pecuniary interest in the appeal, that the Justices are likely to be biassed in the matter, and that reasonable people might well think such a Court might not be impartial. The Committee at the first time of asking got what they desired. On Monday last week, however, the Justices and the Company appeared to show cause against the rule. It was urged that the Justices would not be biassed in the way suggested, and that their minds would not be affected by such questions as whether sufficient deductions for repairs, insurance, &c., are made from the gross value for purposes of rating. The Court was composed on this occasion of the Lord Chief Justice, Mr. Justice Ridley, and Mr. Justice Darling; and the two latter agreed with the Lord Chief Justice in not finding, as a fact, that there was a possibility of bias, or that reasonable people would not think such a tribunal impartial. The view of the learned Judges as to the absolute disinterestedness of Justices in such positions as those against whom objection has been levelled, will hardly square with that of the man in the street. However, there is now nothing to be done but to accept with the best of grace the view of the Courts. Equity in law there should be; and if the Assessment Committee had sustained their objection, then it would have been quite fair to assert that something was wrong with the decision of the Courts when the South Metropolitan Gas Company raised the question in connection with their rating appeal.

To Promote and Protect the Interests of Ratepayers.

There is an ever-growing belief in the greater power of union than of separation and isolation. The ratepayer and the taxpayer have for many years had well-founded causes for grievance; and this has given rise to the formation of ratepayers' associations, who have carried on their watching and criticism purely from the local point of view. But this is not now sufficient; and it is thought that the conditions and burdens of the times require an organization with stronger influence and potentialities as an operative and effective force. Numerous ratepayers' associations are of this way of thinking, and quite a large number of representatives of them recently met at the Cannon Street

Hotel under the chairmanship of the President of the Poplar Municipal Alliance (Mr. Gilbert Bartholomew) to consider a scheme for the establishment of a National Ratepayers' Federation. The objects of the Federation are to be large, broad, and varied; the principal being: (1) To promote and protect the rights and interests of ratepayers and taxpayers in England and Wales; (2) to watch over and investigate the expenditure of the various rate-spending authorities, and to prepare and disseminate reports, statistics, and other information with regard to such expenditure; and (3) to ensure that the accounts of local authorities shall be prepared and audited upon stricter systems than at present, and, in case of municipal trading undertakings, on commercial lines. A resolution was passed to establish a National Federation; so that, after the Memorandum and Articles of Association are agreed upon, and the new organization settles down to work, we may hear more of it through the prosecution of its militant and educative objects. We wish it success.

Creosoted Blocks a Nuisance.

Our tar-distilling readers will be interested in a case that has recently been before the Court of Appeal. A Mr. West, a florist and market gardener at Bristol, was the plaintiff; and the Bristol Tramways and Carriage Company the defendants. The Courts from first to last have been favourable to plaintiff—from the Recorder of Bristol, through the Divisional Court, to the Court of Appeal. The case was one for only a small amount of damages (£40); but the principles and issues involved were large. The injury the plaintiff alleged he had suffered was to nursery plants, growing crops of flowers, &c., by the fumes arising from the tramway through the treatment by creosote of the wood blocks used. The defendants contended that they were protected by their Act; the paving of the track by wood being compulsory to enable them to carry out their statutory obligations. Their Lordships (the Lord Chief Justice, Sir Gorell Barnes, and Lord Justice Farwell) were unanimously against defendants; the Lord Chief Justice pointing out that the statutory obligation of defendants was to "pave with wood" and not wood prepared by creosote. Where, therefore, damage can be done to plant life of any kind, wood blocks steeped in the protective creosote will have to be used with discretion unless the layers of the tramway track are prepared to run the risk of having to compromise a number of petty actions for damage to nurseries and gardens.

NOTES FROM WESTMINSTER.

It was practically a blank in the Committee rooms last week. The corridors were empty and the rooms almost vacant in the forepart of the week, and quite so in the latter part. One day a Commons Committee sat; and for two or three days the Police and Sanitary Committee pegged dutifully away at the Widnes Corporation Bill, so as to be able to rule another measure off their list. Those are the only sittings to place on record; the retirement of Sir Henry Campbell-Bannerman having necessitated the adjournment of the Houses for a week from Monday, and it was understood that nothing but formal public business would call members together again for a brief space before the time at which adjournment would be made for the Easter recess. Permission, however, was given to Select Committees to continue their work until that adjournment; but neither spirit nor flesh exhibited any particular willingness to avail itself of the opportunity. In connection with the Widnes Bill, Mr. Wedderburn, K.C., for the Corporation, told how the ratepayers, jealous for their low-priced gas, and unwilling to forego that low price to provide money for the rulers of local affairs to lay hands on, had stamped out the gas clauses originally appearing in the Bill. Mr. Wedderburn (who did not put the matter exactly as we have done here) seemed to doubt somewhat the wisdom of the ratepayers; but the ratepayers of Widnes have had a long experience of their own business, and know better what is good for them than any one of the eminent leaders at the Parliamentary Bar. However, these clauses having been dealt with by the ratepayers without the aid of Parliament, our interest in the measure ceased before the Committee stage was reached.

In regard to other matters, it is understood that the Long Eaton Gas Company have definitely resolved to challenge the Draycott Gas Company's Bill in the House of Lords. From their point of view, the expense of doing this will not be great; and it is their last chance. Their ignominious failure to justify their action in the House of Commons has apparently no influence in the matter; expense and final chance being, in their opinion, the total factors in determining action. On the other hand, the Draycott Company continue confident that the justice of their cause will take any Committee with them. Among others who are squaring themselves for opposition in the second House are the Retford Corporation on the Lincoln Corporation Water Bill when it appears in the Lords, and the Pontypridd District Council on the local Water Company's measure when it reaches the Commons. Both Bills have been referred to in these "Notes" on previous occasions.

Joint Water Supply Schemes.

From Westminster, attention may conveniently, in conjunction with these notes, be turned to the inquiry that has been held in Edinburgh into certain water schemes, under the Private Bill Legislation Procedure (Scotland) Act, 1889. Among the authorities there seems to be a growing disposition to favour water supply combination schemes for large areas, instead of allowing small communities to undertake water schemes of their own. Joint undertakings are essential in districts where the sources of water supply are not plentiful or prolific. This trend of opinion has been noticed at Westminster; and it was seen at the inquiry into the St. Andrews Water Order which has been under the consideration of the Commissioners sitting in Edinburgh. There is no doubt that St. Andrews badly requires a new water supply; and their scheme proposed procuring what was wanted by tapping the Dunino and Kinaldy Burns. We will not go into the details of the scheme, in view of the fact that it was rejected—the ground of objection being the interesting feature. There were in opposition the burgh of Kilrenny, the County Council of Fife, and the burghs of Pittenweem, Anstruther Easter, and Anstruther Wester. The scheme was well supported by local and expert evidence; but Mr. W. A. Tait, C.E., had inquired into it on behalf of the Local Government Board. In his view, it was quite unreasonable that St. Andrews should be permitted by Parliament to obtain such extensive powers as they asked, without making proper provision for local authorities already in occupation for water-supply purposes of portions of one of the watersheds, and without being under reasonable definite obligation to supply water to any neighbouring local authorities in straits for a supply. From a report, it was seen that the Local Government Board were also of opinion that the proposed scheme involved issues which might seriously affect the whole question of the water supply for the east of Fife. With a small rainfall and a limited gathering-ground common to several local authorities, it seemed to the Board that it might involve great hardship on the other burghs and places if St. Andrews acquired exclusive possession. The view of the Commissioners was on exactly the same lines, that for St. Andrews and the East of Fife there should be one comprehensive scheme. Rejection of the Order therefore followed. It remains now (more water being a pressing necessity in these areas) for the authorities concerned to follow the advice tendered them from Whitehall.

A promotion for the burgh of Troon fared better. The inhabitants also require an additional supply of water; and the Council proposed a scheme to cost £58,000. In this case, too, there were indications of the opinion as to the desirability of joint schemes. The burgh of Prestwick were in opposition; and the result was that a clause was inserted giving to Prestwick the right to a supply of water at cost price, which cost price is to be determined by an independent arbiter to be agreed upon between the parties, or, failing agreement, by the Secretary for Scotland. The cost price is to be revised at the expiration of the period of the redemption of the loan for construction.

THE FRANCO-BRITISH EXHIBITION.

Guarantee Fund for the Gas Engineering Section.

We have received from Mr. James W. Helps, the Hon. Secretary of the Committee having charge of the arrangements for the Gas Engineering Section of the Franco-British Exhibition, the following further list of contributions promised to the guarantee fund:—

Companies.	£	s.	d.
Hornsey	25	0	0
Cambridge	10	10	0
Herne Bay	10	0	0
Barnet	5	5	0
Dartford	5	5	0
Horley	5	5	0
North Middlesex	5	5	0
Redhill	5	5	0
Radcliffe and Pilkington	5	0	0
Wrexham	5	0	0
Durham	3	3	0
Hertford	3	3	0
Gosport	2	2	0
Hexham	2	2	0
Newport (I.W.)	2	2	0
Corporations.			
Birkenhead	10	10	0
Oldham	5	5	0
	£110	2	0

In the list published last week (p. 18), the amount promised by the Stretford Gas Company should have been given as £10 (not £5 5s.); making the total of that list £402 9s. instead of £397 14s. The additional contributions now acknowledged bring up the grand total to £3521 16s.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 113.)

THE Stock Exchange has shown a good tendency during the past week. The resignation of Sir Henry Campbell-Bannerman and the appointment of Mr. Asquith as Prime Minister made an indirect favourable impression on markets; but business was again very quiet in connection with the settlement, in view of the holidays. The success of the London County Council loan being considered a bull point, all gilt-edged stocks improved. Consols touched 97$\frac{11}{16}$ on Wednesday; and the better tone of the Continental Bourses helped to improve the tendency all round. The gilt-edged market continued good on Thursday. On Friday, the sentiment changed, as there was less inquiry for investment securities; and Consols dropped to 87$\frac{5}{16}$ for money. There was renewed dulness on Saturday. The Money Market felt the effects of the large applications for the London County Council Loan, owing to the temporary lock-up of several millions, and rates stiffened. Discount rates hardened towards the end of the week. Business in the Gas Market was, on the whole, on a moderate scale; and, with two exceptions, prices were well maintained. The greatest activity was in Gaslight and Coke ordinary. Business was done between 96$\frac{1}{2}$ and 97 on Monday, and up to 97$\frac{1}{2}$ on Thursday and Saturday; but there was no quotable change in the price. The secured issues also came in for attention. The maximum changed hands at 89$\frac{1}{2}$, and the preferred at 107$\frac{1}{2}$ and 108$\frac{1}{2}$; while business was done in the debentures at 84$\frac{1}{2}$. South Metropolitan was quiet, with a little business at 121$\frac{1}{2}$ and 121$\frac{3}{4}$; the debentures changing hands at 84. Commercials were supported; the ordinary advancing 1 to 104-109. The 3$\frac{1}{2}$ per cent. were dealt in at 102$\frac{1}{2}$; and the debentures at 82$\frac{3}{4}$. The Suburban and Provincial groups were quiet. The only feature was a fall of 2 in West Ham ordinary, to 99-102; business being done at 101. British ordinary was also $\frac{1}{2}$ lower, at 41$\frac{1}{2}$ to 42$\frac{1}{2}$; the shares changing hands at 41$\frac{3}{8}$, and the debentures at 95. We understand that the Directors of the East Hull Gas Company are about to issue £25,000 of ordinary stock at a minimum of £105. The Company have since 1867 paid without intermission the maximum dividend authorized by Parliament. There was not much doing in the Continental companies. Imperial Continental (which rose 1, to 179-81) changed hands at 179$\frac{1}{2}$, 178, and 180; and European at 23$\frac{1}{4}$. As regards the undertakings in the remoter world, San Paulo rose $\frac{1}{4}$ on Thursday to 14$\frac{1}{4}$, and the debentures 1 to 50-52. The shares are now quoted 13$\frac{1}{4}$ to 13$\frac{3}{4}$ *ex div.;* business being done at 13$\frac{5}{8}$, and in the debentures at 51$\frac{1}{4}$. Dealings were also recorded in River Plate at 13$\frac{13}{16}$, and Buenos Ayres at 11$\frac{17}{32}$ and 11$\frac{3}{4}$. Monte Video changed hands at 11, Primitiva preference at 5, ditto debentures at 94$\frac{1}{4}$, Bombay at 6$\frac{1}{2}$, and Cape Town ordinary at 6$\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

Necessary Advice regarding Metallic Filaments—Defects and Transformers—Translating Additional Connections to Eight-Candle Power—Cost of Lighting New Streets by Electricity—What are "Actual Generating Costs?"—A Thunderstorm and a Switch.

SOME very sensible advice was given by Mr. Leon Gaster in an address he recently delivered before the Association of Electrical Contractors on the subject of metallic filament lamps. He made a strong appeal to the contractors present to deal with metallic filament lamps in such a way as not to endanger the industry, as it is entirely a question of the cost of current, price of lamps, and their useful life as to whether it really pays to use these in preference to carbon filament lamps. This being so, he urged that their use should not be indiscriminately recommended, but that each case should be studied on its merits. That is just what is not being done in connection with the new lamps. The sellers have the lamps to dispose of; and, trade having dragged slowly in the past, they want to be among the first to pocket the profits—the interests of the users being altogether of secondary consideration. Instances come to mind. Here is one. A shop window was effectively lighted by a number of small carbon filament lamps with shell-shaped reflectors, which protected the eyes of persons looking into the window, and illuminated the whole of the goods exposed to view. The window, through a contractor's persistency, is to-day illuminated by eight Osram lamps suspended centrally and vertically, and with glaring boldness. The goods in which the tradesman deals are not Osram electric lamps; but the Osram lamps refuse to take second place to those goods, and their concentrated illumination deals harshly with the vision of those who want to see the articles on offer. That shop window cannot now be inspected with comfort. In another case, a boot shop with a deep glass-cased window was formerly lighted by low-candle power electric lamps both at the front and towards the back of the case. To-day those several low-candle power lamps are no more, but three groups of Osrams irritate the eye directly the window comes within inspecting range. The front part of the deep glass-cased window is glaringly illuminated; but the boots exhibited for inspection towards the back of the case and in the lower part are now put into shadow by those in front and above. Economy and effect should go hand in hand; but while electrical contractors can see profit from the sale of metallic filament lamps, and from rearranging installations, they are not going to lose it; and Mr. Leon Gaster's well-meant advice might just as well have been thrown to the four winds, as dropped into the ears of men whose business is subject to great competition, who make profits from the sale of lamps and fittings, and not from the sale of electricity, and whose interests therefore are not those of the electricity supplier. It is true the interests of the latter are frequently affected by the want of discrimination on the part of local contractors for fittings.

In his address, Mr. Gaster referred to the present difficulty of making metallic filament lamps of small candle power even for such low voltages as 100 to 150; the lowest nominal illuminating power being 16 candles for tantalum lamps and 25 candles for Osrams. He also commented on the serious trouble and expense occasioned by breakage. Of course, this is a most important matter from a contractor's point of view, as all the tungsten filaments are particularly brittle and fragile, and subject to considerable breakage in transport. We know the difficulties of, and of the care requisite in, manufacturing the metallic filament lamps—difficulties and care that cost money. But with all the care, there is the trouble from the blackening of bulbs, which Mr. Gaster believes to be due to bad manufacture. Acceptance of this view depends on the definition he gives to the term "bad manufacture;" for the process is such a delicate one, and requires so much prudence, that bad workmanship ought to be an unknown quantity. He also referred to the use of transformers for reducing the supply pressure to a point suitable for the low-voltage metallic filaments, and showed examples of ceiling and house transformers. We can leave Mr. Gaster here; and refer to another point regarding transformers. The new lamps have created quite a boom in these articles; and they are being rapidly sold. Enthusiasm is out-running discretion; and those whose mental vision is not confined to the immediate present see in consumers' transformers little good effect for the future. They increase installation expenses, add another complication to electricity users' installations, and indicate the opinion of advocates that finality has been achieved in lamp making. Yet, the rush to transformers notwithstanding, there are now 200-volt metallic filament lamps on the market; and it is within knowledge that some energetic contractors have already made existing electricity consumers acquainted with them. Events have moved fairly fast in connection with metallic filaments; and no one can say to-day (though the promise is not great) that the lower candle power lamp for high voltages, and with an efficiency of about 1$\frac{1}{4}$ watts per candle, will not be a thing of the morrow. Then these transformers that haste and short-sightedness have put in will be candidates for the scrap heap.

Now that the metallic filament lamp has come along, electricity companies should mend their way of stating the advance of their business connections. The ordinary mode of showing progress has been to reduce new connections to the common level of 8-candle power lamps. Of course, the low unit of light makes things look bustling, even if the net revenue account does not. Supposing a company obtains in a year connections equal to 12,000 8-candle power lamps, the 12,000 looks substantial, more so than (say) 6000 16-candle power lamps, or 3000 32-candle power lamps. But the conversion of the connections to 8 candles is really meaningless so far as business goes, for the number of 8-candle power lamps added to the circuits is no criterion by which business improvement can be measured. Moreover, the reduction to the 8-candle power level is more absurd to-day than ever. Supposing a large part of the additional connections are of the Osram type of lamp; and then let us take a (so-called) 50-candle power one as an example. This lamp would be equal to about six of the old 8-candle power carbon filament lamps; and yet its consumption of electricity would only be something like 60 watts per hour, as against about 192 watts by six 8-candle power carbon filaments. There is no relation whatever between the standard of the past, and the conditions of the present. It is therefore the height of absurdity, under the circumstances, to retain the 8-candle power lamp as the unit to which to reduce new connections. The "Electrician" relinquished the practice in their last tables; but the electrical companies stick to the old plan, and parade the senseless figures before their shareholders. For example, at the meeting of the South London Electric Supply Corporation last Tuesday, the Chairman told the shareholders that the number of lamps that had been added to the circuits last year was the equivalent of 17,608 8-candle power lamps. What does this 17,608 really represent? There may be great confidence in saying that the figure does not mean what the same figure would have meant in the past. Again, it was stated that the equivalent of nearly 5000 8-candle lamps had been added since Jan. 1 last. How many of these lamps were the consumption-saving Osrams or else tantalums? Directors no doubt regard the old standard of conversion for connections as of value in addressing their proprietors, and will retain it as long as possible. The seconder of the resolution for the adoption of the report at the meeting of the South London Electric Corporation found in it a point. "In spite," said he, "of what was heard from the Chairmen of other electric light companies, that gas was cutting into the business, the South London Company had the satisfaction of finding they had 17,608 8-candle power lamps added to their mains." What a little will produce satisfaction! This same speaker also stated that the Lambeth Borough Council ought to keep in touch with the times and other corporations by having their streets lighted by the arc lamp. The "times and other corporations" show a

big use of incandescent gas lighting—much bigger than electricity can boast. However, the officials and Directors of the South London Electricity Supply Corporation are busy urging the Lambeth Council to do something in this way. Even the Chairman of the Company has been attending several meetings in connection with the subject, at which the Mayor and Chairmen of various Committees have been present. However, the low price of gas in South London, and the scheme that the South Metropolitan Gas Company put into operation years ago, for converting the public gas-lamps to the incandescent system, have been an effectual bar to the prodigal system of street illumination offered by the electricians.

There is a new street in Hammersmith, and it may be judged to be a comparatively short street in view of the number of lamp-posts and the amount of illumination that are considered requisite for the protection of those dwelling in it and the safety of those using it. The Electrical Engineer suggests the lighting of the street by eight Osram lamps of nominally 50-candle power; and the estimated cost of an installation of electricity for lighting this street is no less than £166! Just fancy a first-cost equivalent to £20 15s. per lamp! If the Council will condescend to cause the ratepayers to bear this extraordinary expenditure per lamp (to please the Electricity Committee and the Engineer), then the department will only charge the same price per Osram lamp per annum as is paid for incandescent gas-lamps—viz., £3 1s. This kind of thing is described by some people as economical local government.

What are "actual generating costs?" Electricians, as a rule, like to define the term in the narrowest possible manner, in order to assist them in the attempt to justify charges that are made on an elaborate scheme of calculation as to possible (and not always afterwards attainable) load factors, &c., or are made without anything really to justify them. Mr. Snell's recent paper before the Institution of Electrical Engineers ("JOURNAL," Jan. 28, p. 219) showed not a few flaws in connection with the power charges of the Metropolitan electricity supply undertakings. We hear of charges per unit that do not much more than cover the average cost of fuel per unit of electricity generated, let alone the items of oil, waste, water, and stores, wages, and repairs and maintenance, which constitute "works costs" as set out in the "Electrical Times," and which in turn do not include anything for rent, rates, and taxes, management, salaries, office, legal expenses, insurance, and capital charges and depreciation. Electricians have divergent views as to what should constitute "actual generating costs;" their views being squared to circumstances rather than by reason. The House of Lords have, in connection with an appeal from a judgment of the Supreme Court of the Cape of Good Hope, given an interpretation to the term the broadness of which will not be altogether acceptable to central station engineers. The particular case arose on a dispute as to the interpretation of the expression "actual cost" of generating electric light for street purposes in Bulawayo; and their Lordships have upheld the decision of the Cape Court of Appeal that it means the actual expenditure incurred for the production and distribution of current, including depreciation and insurance. Their Lordships, in other words, were satisfied that the expression was to cover the whole series of operations up to the production of light in the street lamps—every cost, in fact, that is incurred (and this would include capital charges) up to the point at which the electricity is used. Their Lordships had a little doubt respecting the inclusion of insurance; but even on this head, they saw no reason to disturb the finding of the Court of Appeal. Anyway, the electrical industry now know the legal interpretation of the term "actual cost of generating electricity," although they are not agreed upon an electrical interpretation.

An extraordinary occurrence is reported by the Madrid Correspondent of the "Daily Telegraph," cabling last Wednesday. He states that the previous night, during a thunderstorm, Señor Dionisio Biain, a wealthy proprietor of the Samorrostro mining district of Bilbao was electrocuted in his own house. Through the inclement conditions outside, the electric light cables were disturbed, and the current broke down. Señor Biain, noticing the peculiar behaviour of the lights, went to a switch to shut off the current. His hand had no sooner touched the switch, than the current passed through his body; and he was instantly killed. Members of his family rushed to his assistance; but fortunately a doctor who was one of the guests, prevented anybody touching the dead man, whose hand still remained in contact with the switch. After taking steps to "insulate himself," the doctor removed the body, and shut off the current. In Bilbao, the correspondent adds, several houses were damaged during the storm; and there is no doubt that a catastrophe was only avoided by the promptitude with which the two Electricity Companies shut off the current, as the street-lighting cables were damaged in several places. Of course, there are many blanks in this general statement that it would be interesting to have filled in.

Institution of Civil Engineers.—At the meeting of the Institution last Tuesday, it was announced that Mr. W. L. Mansergh had been transferred from the class of associate members to that of members. At the monthly ballot on the same occasion, Mr. Harold W. Woodall, of Bournemouth, was elected a member; and Mr. John Bowman, of the Water Department of the Aberdeen Corporation, and Mr. Oswald Cloudsley, son of Mr. J. Leslie Cloudsley, were admitted as associate members.

THE "BUISSON HELLA" MANTLE.

[COMMUNICATED.]

IN view of the notice which has been taken of the above-named mantle in the columns of the "JOURNAL," your readers may be interested to learn that, in the course of a recent conversation with one of the officials of the "Buisson Hella" Company, the writer was informed that the Company had a large stock of filament mantles on hand, and would probably shortly commence delivery. Owing to the arrest of M. Rochette, the promoter of the Company, the business had almost been brought to a standstill, and their funds had been placed under the seals of the examining Magistrate. But the Managing-Director had worked night and day to keep things going, and had been successful in finding sufficient money to pay current expenses; and now that the seals of the Magistrate were to be removed, the business would no doubt rapidly resume its ordinary routine.

It appears that the new factory at Courbevoie has been completed, and arrangements were made for 200 girls to commence working there on the 6th inst. The laboratory, containing the electrical and chemical apparatus for the preparation of the filaments, is situated on the ground floor, and in the adjoining department the girls put the filaments into the disc of refractory material forming the head of the mantle. In future, instead of inserting the filaments singly by hand, a mechanical device will be used, whereby they will be automatically guided into the holes. Some of the mantles shown in a shop window are marked with a selling price of 3 frs. 50 c. (2s. 10d.) each.

The Company are busy experimenting with some new forms of mantles, in order to find a type which will give the greatest possible lighting efficiency. In the present form, the portion of the filament just immediately beneath the disc does not become perfectly incandescent. The form of the mantle is undoubtedly somewhat crude; but the principle of the strong filament or rod, as opposed to that of the fragile knitted or woven fabric of the type now in vogue, is a great step in advance. It is stated that mantles can now be made which will bear handling with impunity, and which may be transported any distance without injury. The knitted and woven mantles have unquestionably been brought to a high state of lighting efficiency; but they have the drawback of being very fragile. The gradual evolution of the structurally stronger type at present represented in embryo by the "Buisson Hella" mantle may, therefore, prove a not unwelcome accession to the lighting appliances available to the gas engineer.

THE HEATING OF HOSPITALS.

AT a recent meeting of the Institution of Civil Engineers, a paper was read by Mr. E. R. Dolby on "Some Methods of Heating Adopted in Hospitals and Asylums recently Built." As its title shows, the paper only deals with the subject of heating in a very limited way, both as regards the methods and the buildings. It is not, therefore, perhaps altogether surprising to find that gas hardly figures at all—nor, needless to say, electricity for heating. The author is principally concerned with steam or hot-water heating, and chiefly in the three institutions of the King Edward VII. Sanatorium at Midhurst, the Royal Victoria Infirmary at Newcastle-on-Tyne, and Camberwell Infirmary, where gas for cooking was used, during 1905-6, to the amount of 5,271,600 cubic feet, which at 2s. per 1000 feet represents £527 3s. 2d.

Further absence of reference to the great utility of gas in such institutions is rather the more surprising, as the author rightly says that it is very desirable that lighting, heating, hot-water service, and ventilation should be considered together, so that the most economical results may be obtained. Surely, for obtaining the highest efficiency with one medium for these quadruple purposes, the use of gas is paramount, especially in securing economy in lighting and adequacy in ventilation. Heating by steam has many defects, as all know who travel in steam-heated railway carriages. Mr. Dolby himself says: "The higher the steam-pressure used, the more objectionable became the stuffy, close smell caused by the baking of particles of matter floating in the air." Then, at low pressures, there is the difficulty of distance, and of getting rid of the water of condensation and air. Leaks are also difficult to locate. The author seems to be in favour of heating by means of hot water in radiators and pipes, because of lower temperature, less fluctuation, greater security, and less cost. But it seems to us that gas-heating would easily compete with this, besides having other advantages, if properly installed. It is to be hoped that, in another and fuller paper, the undoubted claims of gas for consideration and comparison will not be overlooked.

The Late Mr. T. N. Kirkham.—Mr. S. Chandler writes to point out, in reference to the notice of the late Mr. T. N. Kirkham which appeared in the "JOURNAL" last week, that it should have been stated that the deceased gentleman was one of the founders of the business of Messrs. Kirkham, Hulett, and Chandler, Limited; and that of these there remain, by the demise of Mr. David Hulett, Mr. S. Chandler, sen., and Mr. Kirkham, only himself and Mr. Josiah Chandler.

THE BUEB VERTICAL RETORT PATENT.

The Patent Upheld.

THE Nullity Court of the German Imperial Patent Office, sitting under the presidency of Dr. Thiel, recently had before them a petition by Herr Auguste Klönne, of Dortmund, for the annulment of patent No. 167,367, dated July 29, 1903, of which the German Continental Gas Company and Dr. Bueb are the owners, for "A Process for the Production of Gas in Vertical Retorts."

PETITIONER'S DECLARATION.

In support of his petition, Herr Klönne had made a declaration of which the following is a full translation.

The arrangements described in the above patent have already been published in the British patent No. 5712 of 1828, and in the American patent No. 447,506. Especially the above-mentioned British patent treated of vertical, tapering retorts, in which the presence of an empty space, permitting the condensation of tar downwards, was avoided. Further, in special cases, the retorts were entirely filled with coal. The German patent No. 14,050 showed the same arrangement. In this case, the retorts were, in addition, heated by the furnace gases in several superimposed sections, of which, naturally, the lowest was the hottest. The temperature of carbonization was not mentioned in either of the above patents, but, with the generator firing shown in the German patent, the desired temperature could have been reached. A "Kollin" coke-oven was illustrated in "The New Coke-Ovens" by Dürre, published in 1892. In this oven, the retorts were filled full of coal, and were heated in several superimposed sections. This oven is exactly the same as that described in the contested patent.

Further, the advantages ascribed to this process by the patentees were attained before the introduction of the same. A gas almost free from naphthalene and fluid, brown tar are the results of heavy charges, small free space in the retorts, and proper heating, independent of whatever kind of retort is used. The plaintiff, in the installations built by his firm, also applies higher heats to those parts of the retorts which contain the most coal. Again, the prescribed temperatures in the contested process do not present any new feature. According to Herr Körting's article published in the "JOURNAL OF GAS LIGHTING" in 1906,* the working temperatures of the patented process are:

The average temperature of the bottom section is			1418° C.
,, temperature of the second	,,	,,	1338 ,,
,, ,, ,, third	,,	,,	1040 ,,

Therefore, since a considerably lower temperature is attained in the retorts than in the furnace, the retorts of the patented process are not subjected to higher heats than those in either horizontal or inclined furnaces, in which furnace temperatures even as high as 1600° have been observed. Under these conditions, however, the temperature inside the retorts was only from 900° to 1000° C. In support of this statement, plaintiff handed in two letters—one sent by Dr. Pfeiffer, of Magdeburg, the other by the Gas Committee of the town of Königsburg, in Prussia; and he further referred the Court to an article by Dr. Pfeiffer published in the "Journal für Gasbeleuchtung," but was not able to state the date of publication. Moreover, the subdivision of the heating of the retorts into sections (so affirms the plaintiff) has been carried out in furnaces built by him—for instance, at Offenbach and Wiesbaden. Further, since about the year 1880, he has erected furnaces in which large retorts to take heavy charges were placed, in order to obtain a gas nearly free from naphthalene and a fluid, brown tar.

Finally, the statement that in the patented process a shaft through which the gas passes is formed in the coal, is no novelty; for attention was drawn to this by Hilgenstock, in an article which appeared in "Stahl und Eisen" and in the "Journal für Gasbeleuchtung" before the patent was published. The plaintiff was asked when these articles had appeared; but he was unable to give further particulars.

THE PATENTEES' PLEADINGS.

The patentees pleaded for the dismissal with costs of plaintiff's petition for annulment of the patent. The patented process, which is already looked upon, both at home and abroad, as marking a new epoch in the gas industry, consists of the combination of two principles—viz., the absence of a free space in the retorts, and the subjection of the latter to a higher temperature than has heretofore been usual. Success will only be attained by the combination of these two principles, and then only if vertical retorts are used; for horizontal or inclined retorts could never be filled sufficiently to prevent contact of the nascent gas with the top of the retort, and the consequent reduction of the gas and formation of naphthalene would be unavoidable. Therefore, the novelty of the patent cannot be contested on the assertion that the process is merely built up of fractions of already published patents or processes. The plaintiff did not learn from publications, but from the patent No. 167,367, that gas almost free from naphthalene and fluid, brown tar are the results of heavy charges, high heats, and small free space in the retorts.

None of the furnaces described in the publications quoted by the plaintiff could be used without alteration for the purpose of the patented process. The "Kollin" oven is not a gas-furnace, but a coke-oven. Moreover, the contested patent No. 167,367 covers not a furnace, but a process for gas production; and this process was not referred to in any of the publications mentioned. It is especially noteworthy that, although the proprietor of the plaintiff firm declared at a meeting of the German Gas and Water Association in 1906 that the process was not feasible, yet the same firm now seek to represent the process not only as well known, but as obvious. The defendants contend that the facts affirmed in the letters handed in by the plaintiff are non-existent. They admit, however, that temperatures as high as those mentioned in their patent have formerly occasionally been reached in the manufacture of coal gas.

REASONS FOR THE VERDICT.

The Court is unanimously of opinion that the contested patented process is to be regarded as a combination of various principles, for the practical application of which a special plant is necessary. The plant consists of vertical, highly refractory retorts, in which there is no free space permitting of condensation of tar downwards. These retorts are filled up to the top with coal, and then subjected to a higher temperature than is usual. The plaintiff's plea culminates in the assertion that it is impossible to work vertical retorts in any way other than that claimed in the patent, and that, therefore, the patented process is nothing but a return to the vertical retort. This assertion is, however, incorrect. The previously known forms of vertical retorts were either not equipped with the arrangements which are indispensable to the patented process, or they had arrangements which would prevent their use for the patented process. But, in any case, none of the publications cited by the plaintiff describe the essential details of the process on which the contested patent is based.

Referring, first, to the retorts described in the British patent No. 5712 of 1828, and in the American patent No. 447,506, no measures were adopted in either of these to prevent the tar from flowing between the retort and the plate on which the coal rested down into the bottom of the retorts. In the American patent, there are even special pipes provided for drawing off the tar at the bottom of the retorts. The retorts described in patent No. 14,050, and the "Kollin" coke-oven, can also not be worked according to the patented process, because, although they have no unheated space at the bottom of the retort in which tar could accumulate, yet the gas is taken off in special pipes placed parallel to the retorts and subjected to heat. But the contested patent expressly states that, to obtain the wished-for results, it is absolutely necessary to prevent the gas from coming into contact with heated surfaces, so that its temperature may be kept comparatively low. Further, at the time the contested patent was applied for, not only the plant necessary for the patented process, but also the methods of working mentioned in the patent were unknown.

Although there can be no doubt that the previously known types of retorts could have been filled up to the top, yet this was not done, because of the prevailing opinion that a space ought to be provided for the gas above the coal, and for the expansion of the latter during carbonization. The fact that, in order to prevent the formation of naphthalene, the free space must be protected from external heat is not even mentioned in any of the articles cited by the plaintiff. The knowledge that naphthalene is the result of superheating the gas in the retort was therefore new when the patent No. 167,367 was applied for.

The same conclusions apply to the second characteristic of the patented process—viz., the retorts are to be subjected to a higher temperature (from 1300° to 1500° C.) than has heretofore been customary. As a consequence of this high temperature, the layer of coal next to the retort is immediately converted into coke, and, pressing firmly against the same, protects the gas from any contact with the hot surface, and also helps to conduct the heat towards the centre of the retort.

The plaintiff failed to quote any literature showing that gas has been produced at such high temperatures, for any definite purpose, before the application for the contested patent. It is also improbable that a higher temperature than 1200° was ever reached; for, in an article published by the well-known expert Dr. Drehschmidt, in Schilling's "Journal für Gasbeleuchtung" for 1906, p. 678 (a year after the patent had been applied for), temperatures of from 1125° to 1150° C. are spoken of as high; and the plaintiff himself handed the Court a letter written by Dr. Pfeiffer to the proprietor of the firm of Klönne, in which it is stated that even the retorts made by the above firm distorted and broke when subjected to a temperature of only 1280°.

Therefore, when the patent was applied for, it was not realized that high temperatures in conjunction with suitable plant had a beneficial effect upon the quality of the gas and tar. This conclusion is not affected by the fact that sometimes, either for experimental purposes or by accident, gas has been produced at high temperatures which have reached, or even exceeded, those mentioned in the contested patent. Above all—and this is the one important point in a patent embodying several principles—it has not been proved that the process has been anywhere described as a whole. The proof that single parts of the plant used in the practical application of the process had been known before cannot lead to an annulment of the patent. That the introduction of this process represented an advance on former methods of

* See "JOURNAL," Vol. XCIII., p. 342.

gas making is proved by the undeniable fact that many gas-works have replaced their old retorts by those on this system.

The rest of the evidence tendered by the plaintiff is of little importance. As a process for working with large retorts and heavy charges is not part of the contested patent, it really does not matter whether or not such a process was in action at Offenbach and Wiesbaden before the application for the patent. With regard to the publications said to have been made by Drs. Pfeiffer and Hilgenstock, it was not asserted that the patented process was described in them, either as a whole or in its most important details. On the contrary, according to the plaintiff, these articles only referred to single characteristics of the process. The Nullity Court has, therefore, decided not to postpone their decision until further particulars as to date of publication could be brought, the more so as the plaintiff has been allowed ample time to prepare his case.

At the close of the pleadings, the Court rejected the petition, and ordered the plaintiff to pay the costs.

PERSONAL.

We are pleased to learn that Mr. G. EVETTS, at present Chief Assistant to Messrs. H. E. & F. H. Jones, of Palace Chambers, Westminster, has been elected an associate member of the Institution of Civil Engineers, and has been awarded special distinction by the Council in the recent examination. His name was bracketed with those of Mr. H. A. Darling and Mr. Gladwyn; the latter being a student of the Institution. Mr. Evetts studied engineering at the University of Birmingham, and was prepared for the examination by Mr. E. H. Sprague, at the Westminster Technical Institute. He has taken honours in "Gas Manufacture," and gained a County Council scholarship.

By a letter dated the 23rd ult. which reached us yesterday, we learn that Mr. M. MIZUTA, one of the engineering staff of the Tokio Gas Company, who, it may be remembered, was present at the Dublin meeting of the Institution of Gas Engineers last June, in the course of a tour he was making round the world, has arrived safely at home. In the "JOURNAL" for July 30 last, Mr. Mizuta furnished some interesting particulars in regard to the gas supply of Tokio; and he informs us that during the past year it increased at the rate of 20 per cent. as compared with the previous twelve months. He hopes to give, at an early date, an account of the extensions carried out at the gas-works.

Mr. HENRY O'CONNOR is relinquishing the position he has held for the last thirteen years as Manager of the Gas Engineering Department of Messrs. James Milne and Son, Limited, in Edinburgh, and will in future devote the whole of his time to his consulting practice. As an Associate Member of the Institution of Civil Engineers, a Fellow of the Royal Society of Edinburgh, and a Past-President of the Society of Engineers, Mr. O'Connor has had exceptional opportunities of acquiring the knowledge which is required by a consulting engineer. He was trained under Professor Sir A. B. W. Kennedy, Professor Henry Adams, and Mr. Corbet Woodall, and was an assistant to Sir George and Mr. Frank Livesey at the South Metropolitan Gas-Works, Old Kent Road, Assistant Manager and Engineer of the Bombay Gas Company, and Resident Constructing Engineer at the Beckton Gas-Works, under Mr. G. C. Trewby. In the last-named position, he superintended the erection of new gas-works capable of making some 16 million cubic feet of gas per day. As readers may remember, he is the author of "O'Connor's Gas Engineer's Pocket-Book," and part author of Hughes and O'Connor on "Gas and Gas-Works." He has read a number of papers before various gas and other technical societies.

We learn that Mr. J. CARTER MOON, Engineer and Manager of the Middleton Corporation Gas-Works, has been appointed to a similar position at Vancouver, British Columbia. Mr. Moon is the youngest son of the late Mr. W. J. Moon, for many years Engineer and Secretary of the Scarborough Gas Company. After gaining his first experience of gas manufacture on these works, he went, at the age of sixteen, to Messrs. Ashmore, Benson, Pease, and Co.'s, at Stockton-on-Tees, where he passed through the works, and also the drawing and estimating offices. While he was with the firm, he fulfilled, by their courtesy, a temporary engagement in the drawing office during the erection of the water-gas plant. His next engagement was at the Ilford Gas-Works, where he made the drawings for, and superintended the erection of, large extensions to almost every part of the plant, and was ultimately appointed Assistant Engineer and Manager. He left Ilford to take up the position of Works Manager at the Nottingham Gas-Works, where, among other things, he took part in the installation of the De Brouwer charging and discharging machines and in the remodelling of the inclined retorts. He was then successful in obtaining the position of Gas Engineer and Manager to the Corporation of Middleton, in whose service he has been for about two years, during which time the working results have been greatly improved, and drawings and estimates prepared for extensions to the value of about £16,000, for which the sanction of the Local Government Board is about to be asked. In his new field of labour, there appears to be good scope for bringing into use the experience he has gained, for Vancouver is a rapidly growing town (the present population is 70,000), and new gas-works will become necessary in the course of a year or two.

INCREASED WATER STORAGE FOR LONDON.

Commencement of a Large Reservoir at Chingford.

A NUMEROUS company accepted the invitation of the Chairman (Sir R. Melvill Beachcroft) and members of the Metropolitan Water Board to witness the commencement, on Saturday afternoon, of an undertaking which, when carried out, will constitute a very important addition to the series of great works upon which the inhabitants of London depend for their supply of water. The party were conveyed by special train from Liverpool Street Station to Ponders End, which was reached shortly after three o'clock. A few minutes' walk brought the visitors to the south-west corner of the site which has been marked out for the construction of a large reservoir, where they were received by the Chairman of the Board, the Vice-Chairman (Mr. E. B. Barnard, M.P.), and the members of the Reception Committee. Upon the ground there had been erected a framework which gave the visitors a good idea of the height of the reservoir and of the slopes of its inner and outer banks—3 to 1 and 2½ to 1 respectively; and particulars of its capacity and other details were furnished in an artistic *souvenir* of the occasion which had been presented to them.

The company having assembled at the spot selected for the ceremony, the Chairman remarked that the Water Board had been in existence for five years, during four of which they had had the control of the water supply of the Metropolis. They had not met with much encouragement from the public, who displayed a tendency to find fault with them. However, they had gone on quietly yet energetically with the work entrusted to them. Just a year ago, they brought into use two new reservoirs at Walton, and they had completed the Staines reservoirs intercommunication works—the former serving the Southwark and Vauxhall, and the latter the New River district. Coming to the reservoir about to be commenced, he referred in terms of high commendation to the Directors of the East London Water Company and their able Engineer (Mr. W. B. Bryan) for initiating the scheme of which it forms a part. He said it would be 1¾ miles in length, would hold 3000 million gallons of water, and would more than double the present storage in the Lea Valley—viz., 2500 million gallons. In the Thames Valley, the Board had storage to the extent of 6500 million gallons; and an additional 1000 million gallons would be provided for the Lambeth district. Altogether they would have about 13,000 million gallons of storage, which would be sufficient to last till 1917. He combated the assertions made to the effect that the construction of storage reservoirs was a great mistake—that this was not the proper way of meeting the increased demands for water in the Metropolis. He contended that they were absolutely necessary and would allow of the utmost utilization of the existing sources, so that distant ones need not be resorted to. In support of his remarks, he cited the excellent results shown by Dr. Houston, the Board's Director of Water Examinations, to be obtained by the storage of water in reservoirs, in the destruction of all harmful bacilli. Everything pointed to the confirmation of the view held by the Government Water Examiner, that storage was as strong a line of defence as filtration; and that, provided water was properly stored and afterwards filtered, danger was practically negligible. He characterized the Thames and the Lea as the most wonderful sources of water supply a city was ever blessed with, and said its inhabitants might drink with impunity the water which these sources furnished. In conclusion, he asked Mr. Barnard, who, he said, had been Chairman of the Works and Stores Committee of the Board from the commencement, to add a few remarks.

In complying with the request, Mr. Barnard submitted that the Board had discharged successfully the duty imposed upon them by Parliament. He supported the Chairman in eulogizing the action of the Directors of the East London Water Company in courageously facing the difficult position in which they were placed in connection with the supply of water to their district, and following the advice of their Engineer in the matter of the construction of subsidence reservoirs. Indeed, he credited the Company with being the pioneers in their introduction. He also pointed out that it was through them that the works of the several Companies were connected by means of the intercommunication scheme, so that one could help the other in case of emergency.

At the close of Mr. Barnard's remarks, a silver spade was handed to him, and with it he cut the first turf, which he deposited in a barrow and wheeled away amid applause. Mr. P. B. Malone, J.P., the Chairman of the Reception Committee, then proposed a vote of thanks to Mr. Barnard, and asked him to accept from the contractors a memento of the occasion in the form of a small silver wheelbarrow, bearing a suitable inscription. The vote having been cordially passed, Mr. Barnard briefly acknowledged it and the gift by which it was accompanied. Hearty cheers were then given for Sir Melvill and Lady Beachcroft, and the proceedings came to a close. Light refreshments were afterwards served in a marquee, and most of the company returned to town soon after five o'clock.

Particulars of the Reservoir.

Those of our readers who followed the history of the water supply of the Metropolis under the *régime* of the Companies, as recorded in the pages of the "JOURNAL," will probably remember that during the sittings of the Royal Commission presided over

by Lord Balfour of Burleigh in 1892-3, a scheme was laid before them by Mr. W. B. Bryan, M.Inst.C.E., the Engineer of the East London Water Company, showing the capability of the River Lea to yield additional water. The scheme comprised a chain of six reservoirs extending northwards from Walthamstow to Enfield Lock, and the raising of the level of an existing reservoir to the extent of 9 feet. Parliamentary powers were obtained in 1894 for the construction of the first instalment of the reservoirs, and in 1897 for the second; and these have all been finished and in use for some years. In 1899, the Company applied to Parliament for authority to complete the scheme by the construction of the last two reservoirs, and the laying down of a number of conduits or pipe-lines. It is scarcely necessary to say that their Bill was opposed, among other bodies, by the London County Council; but it was nevertheless passed by a Select Committee of the House of Commons presided over by Sir Joseph Pease, and went up to the Lords. There it was considered by Lord Brougham's Committee, who, in spite of the evidence adduced by a host of expert witnesses, rejected it. Undaunted by their defeat, the Company went to Parliament again next year, only to encounter the same opposition, but, fortunately, not to sustain another defeat. Their Bill came first before a Committee sitting under the presidency of Colonel Gunter, who had the promoters' case ably laid before them by Mr. Pember and Mr. Claude Baggallay, who were supported, in addition to the Company's Engineer, by many eminent experts. The result was the passing of the Bill, and its submission to the Upper House, where it came before a Committee presided over by the Earl of Camperdown. Though Mr. Pember was unable to bring before their Lordships the array of witnesses who had given evidence in the Commons, they were quite satisfied, on what he and Mr. Bryan told them, that the Bill should be allowed to proceed. There was no further obstacle to it; and the Royal Assent eventually gave the Company powers they had previously been thwarted in obtaining. In the exercise of these powers, which subsequently passed to the Metropolitan Water Board, about 1000 acres of land have been acquired, and the reservoir commenced on Saturday will cover a considerable portion of it. When completed, it will contain, approximately, 3000 million gallons, or 300 million gallons less than the reservoirs at Staines, with which it was compared by the late Sir Frederick Bramwell when giving evidence in favour of its construction. Its water area will be 416 acres; and the length of the embankment (which will contain 3¼ million tons of earth taken from the inside of the site) 4½ miles.

The reservoir will be filled at its northern end with water pumped from the River Lea and the Lea Navigation when the flow of the river is high, and at as early a period as possible after floods, when the turbid water has been allowed to run to waste. It is proposed to put down machinery capable of lifting 200 million gallons of water per day. After it has been for a considerable time in the reservoir, it will flow through regulating towers into a tunnel, and then along a channel nearly two miles in length to the existing supply basin adjoining the Chingford pumping-station. Thence it will pass by the existing duplicate channels to the High Maynard reservoir and the others lying to the south of it, and eventually to the filter-beds at Lea Bridge, where it will be prepared for distribution. The new reservoir will be available not only for the eastern district of the Board, but likewise, in case of need, for the New River district. There has recently been erected at Ferry Lane, Walthamstow, a powerful steam turbine-pump capable of delivering 10 million gallons of water daily into the New River channel at Stoke Newington.

In addition to the reservoir, the contract includes the diversion of the River Lea by a new channel three miles long and 55 feet wide, extending from a point north of the reservoir to the junction of the channel from Keid's Weir. The intake channel will be constructed just below Enfield Lock; and at the end of it will be situated the pumping-station. An effluent channel is to be formed for the purpose of collecting surface water from the eastern side of the valley, so as to discharge to waste into the Lea below Flander's Weir. The existing supply channel commencing at that weir is to be straightened and improved. A portion of the Lea Valley Road and Marsh Lane is to be diverted; and bridges over the Lea diversion and the outlet and effluent channels will be constructed. The contract has been awarded to Messrs. Charles Wall, Limited—the amount being £340,859; but this does not include the engines, pumps, boilers, and the necessary buildings, for which additional contracts will be entered into in due course. The works were designed by Mr. Bryan, who is now the Chief Engineer of the Board.

For the engineering details given above we are indebted to the *souvenir* of the occasion which was furnished to the visitors. It contained portraits of Sir R. Melvill Beachcroft, Mr. Barnard, and Mr. Bryan; a map showing the group of reservoirs already constructed, the site of the one now commenced, and the neighbouring district from Waltham Cross to the Lea Bridge works of the Board; and six reproductions (on a small scale) of drawings of different portions of the reservoir. An idea may be formed of the magnitude of the Board's undertaking when it is stated that they have jurisdiction over an area of 537 square miles, having a population on Dec. 31 last of 6,962,000. Their storage reservoirs for filtered and well water have a capacity of 243 million gallons, and of unfiltered water of 8913 million gallons; while their filters occupy an area of 162 acres. The average daily supply of water last year was 219 million gallons, or sufficient to fill a canal 110 miles long, 20 feet wide, and 3 feet deep.

METROPOLITAN WATER (CHARGES) ACT, 1907.

By George Kebbell.

(*Continued from p.* 696 *of Vol.* CI.)

After perusing the Act, one is left in astonishment that no attempt was made to explain or enlarge some of the regulations passed under the Metropolis Water Act, 1871. Here was a golden opportunity to have added some short provision as to the much discussed and vexed question of the stop-valve. But all that occurs in the Act on this subject is contained in section 35, which says "nothing in this Act shall prejudice or interfere with any regulation made under the Metropolis Water Act, 1871." Consequently, the regulation relating to the "stop-valve"—*i.e.*, No. 12 of 1871—is still as indefinite as when sanctioned by the Board of Trade in 1872. This regulation provides for the consumer's pipe having "at or near its point of entrance into the premises, and, if desired by the consumer, within such premises, a sound and suitable stop-valve . . . ." The regulation concludes by saying that, "if placed in the ground, such stop-valve shall be protected by a proper cover and guard-box." Therefore, it is clearly contemplated that the stop-valve may, "if desired by the consumer," be actually inside the building, provided it is "at or near the point of entrance into such premises." But the question over which there has been endless contention and litigation—viz., whether there are to be two stop-valves—has never been settled by any decision which can be regarded as an authority.

It has always been contended for the consumer that, if he pleased, he could have the stop-valve inside his premises. Of course, what happens is that the Board put an outside stop-valve whether there is one inside or not. But the writer has considerable doubt what would be the result if the consumer insisted upon having one stop-valve, and one only, and that "within such premises." The Board have no right or power to interfere with the consumer's pipe, which has been defined as extending "from the . . . . supply pipe of the company up to the stop-valve prescribed in regulation No. 12." What would the Board's position be in the event of a serious escape of water inside a house to which they could not obtain access in consequence of its being locked up, or for some other reason, and in which house the stop-valve was inside the street door? A very serious loss of water might take place in a few hours, one consequence of which would be to reduce the pressure, and so render it impossible to get a supply in case of fire. The Board could not break into the premises, for they would be trespassers. The only course available to them would be to open the road over the main and disconnect—a work of some hours, if not days, as the Board must first communicate with the parish authorities.

It is difficult to understand why some attempt was not made in the new Act to meet the difficulties and clear up these ambiguities. But what seems most remarkable is that some efforts were not made to provide for disconnecting without the objectionable necessity for opening-up the road. Surely an outside stop-valve might be used and so constructed that it should be under the control, and the control only, of the Board's officials. Of course, one realizes that evilly or mischievously disposed people might take the trouble to discover how to manipulate the valve; but it would have been a very simple matter to make this an offence punishable by fine or imprisonment. The present system of disconnecting is not only barbarous, but about as clumsy and expensive a process as could well be conceived, and has never been altered or improved upon since the time of Sir Hugh Myddleton. In some instances the total cost of this primitive proceeding, when it includes both disconnecting and re-connecting, is between £5 and £6—that is to say, such an amount has been demanded and paid. But whether it is "the reasonable costs and charges of and incident" to the disconnection and re-connection has seldom been contested; for the simple reason that the consumer is in dire need of the supply, and it might take weeks or months to obtain a decision as to what were "the reasonable costs and charges" which the law says the Board "shall be paid in advance."

It has been the custom of the old companies to introduce into their Private Acts a section giving them power to supply water for trade purposes "at the rate and upon the terms and conditions agreed upon." No doubt there was good reason for this. It was only equitable that the company should be able to protect both itself and its customers against circumstances and vicissitudes which might render it difficult or inadvisable to continue to give an unlimited meter supply for such trade purposes. The Board's new Act, however, empowers them, "by agreement with any person . . . . desiring a supply . . . . for any purpose . . . . to furnish such supply upon such terms and conditions as to payment and otherwise as may be agreed upon." Consequently, the Board may now enter into a contract for a supply of any possible description upon any terms which the consumer and the Board may agree to. But whether by oversight or careful forethought, the words "in writing" have been omitted after the word "agreement." If anyone acquainted with water questions and disputes was ever consulted upon the drafting of the Bill, he must have known of the difficulties that have arisen when the Courts have been called upon to decide some question arising under the section in the old companies Acts by reason of the words "in writing" having been omitted. It was, of course, of

much smaller importance when the section was limited to trade supplies, and the difficulties were generally those of the consumer who had nothing in writing on his side showing his own part of the contract. The company had always, or nearly always, the terms in their favour in writing.

The consequence of the omission of these two simple words "in writing" is that the Board are masters of the situation. The words are that "the Board may" (not "shall") "give this supply." Consequently, if they please, they may at the outset insist that one of the "terms and conditions" shall be that the contract is in writing. If, however, they choose to give a supply by agreement verbally, they can do so; and it will be strictly and literally a compliance with the section. Therefore, when a question arises as to the Board's liability for a breach of some statutory enactment, they can give evidence that it was verbally agreed they should not be held liable under the circumstances. They might even fail to give a supply at all for several days, or pump mud and water, and then prove that, by word of mouth, it was agreed that they should not be liable. They might even go the length of giving evidence that one of the "terms and conditions as to payment" was that the consumer should pay an enhanced rate; and if the jury believed this statement, they would recover. The moral of this is that customers taking a considerable supply, or owners or occupiers of large establishments, will be well advised to see that their agreement for supply is in writing, and in plain and unmistakable terms—that is, if they want to avoid any likelihood of a dispute and litigation.

The section (8) which is causing so much adverse discussion is the one which enables the Board to levy an all-round rate of 5 per cent., and is apparently flawless. It will prove a great hardship to many consumers, especially in the New River district. In the City particularly, where taxation is already to many a cruel burden, it seems especially unfair to have increased the rate, which was already unconscionably large. However, it is useless now to denounce the extortion, for such it is. The Bill has become law, and the time has gone by for opposition. Unless and until the section is repealed, the Board can, and most assuredly will, demand and obtain its pound of flesh. The words in the section are that they shall be entitled to a rate per annum "which shall not exceed 5 per cent." It is open to them to accept a rate at any percentage they like short of five; but does anyone outside a lunatic asylum suppose they will abate one penny piece? It will be sheer waste of time and breath for the consumers to appeal to the Board to forego any part of this plunder; for apparently they will want all the money they can get to carry on their operations as they are now being carried on. Hundreds of the old and experienced servants, still able and willing to work, have been superannuated, and repeatedly fresh batches are being retired. The amount paid to these old servants must be enormous; and practically it comes to this, that two men are being paid for one man's work, and such work is being done, or not done, by young and inexperienced men. Things may right themselves in the course of the next ten years; but meanwhile the drain must be stupendous. These remarks have no reference to the engineering staff, which for capacity has probably no equal in the world. But, unfortunately, they are controlled by men who, in the natural course of things, have no possible knowledge or experience of water matters, and unthinkingly consume the valuable time of the engineers in the discussion of subjects which are "A.B.C." to the engineers and "Greek" to the Committee.

Water Gas for Lausanne.—Following the example of Geneva, the municipal authorities of Lausanne have installed water-gas plant, on Humphreys and Glasgow's system, equal to the production of nearly 250,000 cubic feet per day.

North of England Gas Managers' Association.—The sixty-first half-yearly general meeting of this Association will be held at Newcastle next Saturday week, under the Presidency of Mr. H. Wilkinson, of Harrogate. Three papers are to be read and discussed: (1) "Depreciation and Kindred Matters," by Mr. C. H. Armstrong, of Wallsend; (2) "A Successful Method of Working a Slot-Meter Business," by Mr. J. A. Morfett, of Sunderland; and (3) "A Few Practical Notes on High Temperature Carbonization," by Mr. Alexander Allan, of Scarborough.

A New Gas in Germany.—In the "JOURNAL" for the 17th of December last, reference was made to a report by Mr. Shank, the United States Consul in Germany, on the Dannert gas, plant for the production of which had been put up in 1906 in the small town of Tostedt. It appears, from some particulars contained in the Engineering Supplement to "The Times" last Wednesday, that the material used in the manufacture of the gas is either gas or metallurgical coke. The quantity consumed per cubic metre (35·3 cubic feet) of gas generated is only 0·9 to 1 kilo.—that is, only 9 to 10 double waggons of coke are required for a yearly production of 100,000 cubic metres of gas, while the corresponding figure in the case of a coal-gas plant of the same capacity would be 35 double waggons. Some kind of oil is used for carburetting; 250 to 300 grammes being required for each cubic metre of gas, corresponding to 2·5 to 3 double waggons per annum in the case of an annual output of 100,000 cubic metres. As no bye-products are generated, the operation is correspondingly simple. It is stated that the new gas gives a bright flame in an ordinary burner.

POINTS FROM PRESIDENTIAL ADDRESSES.

[COMMUNICATED.]

IT has always been the custom to forego discussion on Presidential Addresses; and for this reason it may be worth while reviewing those of the past twelve months—drawing attention to important points raised, and repeating some of the more noteworthy schemes and ideas which have come before the meetings of the various Gas Associations.

One or two matters were the subject of fairly general attention; and in this connection it is noticed that appreciation of retort-house governors was expressed at nearly every meeting. Some engineers, indeed, have gone so far as to say that by their use they have obtained an increase of 500 cubic feet of gas per ton. Results of this kind emphasize the necessity of their universal adoption, more especially in the case of small works where the exhauster is unattended. Even in large works, with a man constantly on duty, and, moreover, with the assistance of reliable engine governors, it is sometimes extremely difficult, without retort-house governors, to maintain a steady "pull" on the exhauster; so that the conditions in small works, where there is no engineman, must necessarily be the reverse of satisfactory.

Another matter which was touched upon by several Presidents was the value of the Commercial Section in a Gas Association. This branch is, of course, formed to deal mainly with the sale of residuals; and it is quite certain that no better means can be employed to obtain adequate prices for bye-products than a properly constituted commercial branch in each district. Mr. J. Davis (of Gravesend), at the Eastern Counties Gas Association meeting, described the Commercial Section as a "very valuable adjunct to our Association." Mr. W. Prince (of Stoke-upon-Trent), at the Manchester Institution meeting, expressed the opinion that "considerable financial advantage must accrue to the employers of members from the policy advocated—that is, to secure the best possible prices for the whole of our bye-products." It is to be hoped that other Associations will not be backward in following what is undoubtedly a wise example, and a policy which has been found to work so beneficially in practice.

Mr. Davis called attention to the totally inadequate amounts which municipal electrical undertakings so often contribute in rates and taxes. He gave a conspicuous instance in the unfair treatment of the Gravesend Gas Company as compared with that of the municipally-owned electrical undertaking. Below are the proportions paid by each for the year 1907; and for purposes of comparison the amount paid by a typical electrical company (the St. James and Pall Mall) is added:—

Amount of Rates and Taxes paid by

CALCULATED ON	GRAVESEND GAS COMPANY.	GRAVESEND ELECTRICITY UNDERTAKING.	ST. JAMES AND PALL MALL.
	Per Cent.	Per Cent.	Per Cent.
Total capital expended	1·0	0·12	1·7
Gross revenue	13·1	1·90	6·4

This grievance is further accentuated by the increasing use of electric street-lamps at an enormously increased cost as compared with the gas-lamps previously employed. When, too, we are told that the average loss on the electrical undertaking during the past five years has been over £500 per annum, to which the gas company must, as ratepayers, contribute, we realize how seriously unfair is this competition, and how earnestly it calls for redress. This is merely mentioned as a typical case among scores which could be enumerated in other towns.

Mr. Davis and Mr. L. Hislop (North British Association) both referred to the excellent paper read by Mr. R. M. Searle at the Gas Institution meeting in Dublin, and remarked on the extraordinary possibilities of high-pressure gas distribution, and the ease with which a relatively enormous quantity of gas may be passed through a small pipe. To those interested in the subject, a perusal of this excellent and practical paper is recommended. In connection with the matter Mr. Norton H. Humphrys' statement in his recent Presidential Address to the Southern District Association, to the effect that a wrought-iron or steel pipe will supply 30 to 40 per cent. more gas than an ordinary cast-iron socket-and-spigot pipe of similar size and under equal conditions of pressure, is interesting and significant, and accounts in some measure for the observations of gas engineers who have had experience of high-pressure distribution.

Mr. Davis made brief mention of the Workmen's Compensation Act, 1906, suggesting that it might be possible for gas companies as a body to combine to institute a system of self-insurance. In connection with this matter, nothing need be added to the report of the Committee of the Institution of Gas Engineers—a report which, though short, contributes substantially to the hitherto limited information at the disposal of administrators of gas undertakings.

Mr. Hislop, at the North British Association meeting, also spoke strongly upon the lack of interest shown by some of the members, attributing it in a great degree to the fact that many of the papers read at the meetings do not appeal to the majority of the members, who are for the most part managers of small works. There is

undoubtedly much justification for this expression of opinion; and the most successful Association is that which so shapes the transactions as to interest the majority of the members.

Mr. Hislop's remarks on the advantages of a sulphate of ammonia plant, even for very small works making only 10 million cubic feet per annum, are very true; and it is astonishing how many works are still selling their liquor at a totally inadequate price. Sulphate of ammonia can be manufactured quite as cheaply in a gas-works as in that of the distiller; and the saving in railway freight alone yields a handsome profit. The plant, moreover, is simple and inexpensive; and the product always commands its full market value.

Mr. Edward Jones's address at the Wales and Monmouthshire Institution may be described as being thoroughly practical. He is one of those in favour of the adoption of coke-oven principles in gas-works; and he considers that this change is necessary if gas is to be cheapened. Why, we may ask, should we limit ourselves to small retorts, the largest of which appears to be about 23 in. by 16 in.? Why should we now not have large retorts to hold tons instead of hundredweights? The small type was only adopted for the purpose of more easily charging and drawing the retort by hand labour; but now that we can instal powerful machinery to do the work, it is no longer necessary to confine ourselves as to size. It is quite certain that, the larger the unit dealt with in one operation, the cheaper will be the cost. Besides, he change will bring with it other advantages in the shape of larger and harder coke, freedom from stopped pipes, and, probably, more ammonia.

Mr. Jones's method of working with a dry main is interesting; and his average make of 11,700 cubic feet per ton of good 15-candle gas bears testimony to excellent working in the retort-house. Briefly stated, the method of working is as follows: Before drawing the retorts, the hydraulic boxes are filled with liquor, giving a 1-inch seal. After the end of the charge, the boxes are emptied; the liquor being returned to the well, while the gas is drawn off through the dry main. This continued "flushing" naturally brings about a considerable rise in the temperature of the liquor in the well; but this difficulty is overcome, as has been done in other works, by passing the liquor through a cooler, the tar having first been separated. In this particular instance, the sulphate returns, as the result of this arrangement, increased from 24½ to 28½ lbs. per ton of coal. Doubtless there are works where the temperature of the liquor in the well is considerably above (say) 70° Fahr. In these cases, much benefit would be derived from the use of a liquor cooler. Now that liquor seals in the boxes are becoming universally adopted, the necessity of this addition is rendered essential if good sulphate results are to be obtained.

A description of the Hastings carburation process for the prevention of naphthalene deposits—a method which has met with much success—is included in the address. Here we have a treatment which consists of adding to, not extracting from, the gas. This always appears to be a preferential method; for extraction necessarily means the loss of hydrocarbons, which, so long as they can be retained by the gas, add to its illuminating and calorific power. In this process, a fine mist of petroleum is forced into the gas; and it is found that an exceedingly small quantity—costing only 0·017d. per 1000 cubic feet sold—is quite sufficient to retain the naphthalene in suspension.

To those engineers who are under restrictions as to sulphate effluent liquor, perusal of Mr. Jones's description of a neutralizing process for the treatment of saturator gases will be of interest. Here we have a plant in which the sulphuretted hydrogen in the saturator gases is burnt; the products of combustion being washed by close contact with the effluent liquor. Part of the products of combustion (the sulphur dioxide) is absorbed by the liquor before passing into a tower filled with limestone, where the acid gases are completely neutralized. It is satisfactory to notice that this method not only meets with the complete approval of, but is also highly recommended by, the Alkali Inspectors.

Mr. J. W. Napier's address to the Scottish Gas Managers includes a table in which the charges applicable to the users of gas for power purposes are separately stated, from the experience gained at Alloa, where a system of differential rates for power and industrial requirements is in force. They are as follows:—

Consumption per annum. Cubic Feet.	Per 1000 Cubic Feet. s.	d.
Lighting rate	2	2
Up to 400,000	2	0
400,000 to 750,000	1	10
750,000 to 1,250,000	1	8
Above 1,250,000	1	6

Mr. Napier does not explain, and it is not clear, how his figures are arrived at. While his net expenditure amounts to 24·90d. per 1000 cubic feet, he estimates that the expenditure applicable to gas for power is only 15·11d. It would be interesting if he would give details of the method by which these figures are obtained. To many engineers, calculations of this kind are matters of extreme complexity, and on a par with figures showing the increased price realized from coke by virtue of using a carburetted water-gas plant.

Mr. Hubert Pooley (Midland Association) is one of those who claim that the adoption of retort-house governors resulted in an extra yield of 500 cubic feet of gas per ton of coal, with other attendant advantages. In speaking of comparative costs with regard to carbonizing wages, the President says: "Some works include practically everything up to the exhauster; others include stokers and wheelers only. Some include repairs to machinery, and some do not; and so on." This being so, it is merely waste of time to compare figures so elastic; and few will deny that some agreement as to the proper items to include under each heading is urgently needed. It is the usual custom to suggest that the Institution of Gas Engineers should give their consideration to any necessary improvement; and so the writer will only add that this matter is in earnest need of final settlement.

Mr. Pooley explains the novel system of profit-sharing as adopted by the Stafford Corporation. In this case, the bonus depends entirely on the cost of manufacture and distribution, less any special charges which may have been debited to the revenue account. A standard amount of 10d. per 1000 cubic feet sold is fixed, and the bonus to be paid amounts to one-fourth of the difference between this figure (10d.) and the actual figure for any one year. Thus the bonus will vary in accordance with that portion of the expenditure over which the employees have direct control; and for this reason the scheme will doubtless find favour with workmen, though it is certainly not based on such idealistic principles as the co-partnership scheme of Sir George Livesey. But it matters little if the details do vary, so long as the principle of co-partnership is still existent. At Stafford, the bonus has risen from *nil* in 1902 to 7½ per cent. in 1906. In 1903 it was 3½ per cent., in 1904 5 per cent., and in 1905 7 per cent.—showing very material advances, much of which is due, according to Mr. Pooley, to the pocket interest the men have in the results.

Mr. Pooley outlines a scheme for the extension of gas-fires, forming an estimate of the consumption to be derived from their use if the price were suitably reduced. First of all, he assumes that three fires would be fixed for every cooker at present installed—and 90 per cent. of the consumers in Stafford have cookers. Secondly, he assumes that each fire would consume 20 feet per hour, and would burn four hours a day for four months of the year. On these bases, he estimates that the increased consumption would amount to 50 per cent. This is a very sanguine figure, and hardly likely to be realized in practice. If an undertaking were to increase its consumption by one-half this amount, it should consider itself fortunate. At the same time, if coal-fires are ever completely displaced by gas-fires, this result—viz., 50 per cent. increase—might be possible.

Mr. Pooley's figures on the efficiencies of electrical lamps are interesting and authoritative. It will be remembered that the gas and electrical works at Stafford are both under his management. He is very much in favour of the tantalum lamp—giving its efficiency, when new, at 1·8 watts per candle, with a drop in efficiency of not much more than 10 per cent. in its life of from 500 to 800 hours. Mr. Pooley's address met with much praise from the members, and it undoubtedly deserved all that was accorded it.

Mr. W. Prince, at the Manchester Institution, spoke highly of the work performed by the Carpenter retort-house governor, and also of the advantages of working with tar towers, so that the tar as it is formed in the hydraulic main may be regularly and continuously drawn off. He explains that difficulties with naphthalene deposits are met with by bubbling the gas through a layer of "Solvene" in a Livesey washer. Though one would anticipate good results from this treatment, one is not told whether the system is efficacious; but the cost of the washing is given as 0·07d. per 1000 cubic feet.

Mr. Prince, in giving his views with regard to the rating of gas undertakings, suggests that "a fixed sum per 1000 cubic feet of gas sold or per ton of coal carbonized would be the most equitable solution of a very knotty problem." As he points out, of the 35 undertakings whose figures are included in "Field's Analysis," the maximum charge for rates amounts to 4·33d. per 1000 cubic feet sold; while the minimum is less than one-seventh of this figure, or 0·6d. In face of these disconcerting variations, it is not surprising that the quinquennial valuation is invariably connected with feelings of dissatisfaction.

Mr. T. J. Reid's address to the Irish Association was mostly on topics of local interest, and chiefly applicable to the managers of very small works. He greatly deplored the feeling of insecurity with which shares in Irish gas companies were looked upon by both the Irish public and their banking institutions. This is much to be regretted; for progress is, and will continue to be, impossible so long as this feeling exists. Mr. Reid expresses the opinion that "there is undoubtedly a splendid field for the investment of Irish money in Irish gas concerns."

The President of the North of England Association, Mr. H. Wilkinson, of Harrogate, described the new scheme for conveying the Company's coal from the railway (a distance of 1¼ miles) to the works. This has in the past been carried out by a system of road traction, which cannot be considered suitable for an undertaking of sufficient size to carbonize 100,000 tons of coal. The new method is to convey the coal in waggons on a light railway built by the Company. That there were difficulties to overcome is clear; for of the total length of 1¼ miles, some 800 yards had to be tunnelled. The whole scheme appears to be excellent, and evidently a preferable one to that previously mooted—of moving the works to the railway. In speaking of the flourishing position of the gas industry at the present day, the President mentioned that the consumption of gas in the United Kingdom has increased from 94,645 to 161,407 million cubic feet (70½ per cent.) in the sixteen years from 1890 to 1906.

Mr. H. W. Woodall's address to the Southern District Association was brimful of excellent suggestions and sound reasonings.

His was undoubtedly the address of the year. Gas engineers who have to compete with "free-wiring" by electrical undertakings, would be well advised to read Mr. Woodall's remarks upon this subject. He stated that certain electric light companies are introducing into their "free-wiring" agreements a clause which prohibits the consumer, in consideration of certain special terms, from using any other methods of lighting during his tenancy of the property. It is a moot point, according to eminent legal authorities, whether they have power to insert such a clause. The President of the Southern District Association maps out a programme for the Institution. The first item relates to a new or amended Gas-Works Clauses Act, which all are agreed is out of date, and urgently calls for revision. He contends that the next session of Parliament should certainly see the new Bill introduced. The second item is in connection with an authoritative statement by eminent scientists, and only by those whose names are well known to the public, as to the non-injurious effect of the use of gas on personal health, fabrics, leather, and decorations generally. It will be remembered that Mr. Charles Carpenter is another in favour of the final settlement of this vexed question. With regard to this matter, Dr. Samuel Rideal's recent article on the "Relative Hygienic Values of Gas and Electric Lighting" is of extreme interest.

Mr. Woodall believes in profit-sharing, and also in the education of workmen by means of evening lectures with discussions on subjects connected with the work of the company. He further believes in encouraging men to attend evening classes; and, as an inducement, he suggests that companies should pay the fees. A "Suggestion-Box," and a system of paying foremen by results, have both been instituted at Bournemouth; and one is told that the former has "worked remarkably well"—and, doubtless, the latter too, though no opinion on the subject is vouchsafed. Consideration for the men's welfare is further shown by the liberal contributions towards their recreations. All these things are, indeed, excellent, and are object-lessons to others.

A few details of road traction are given; and that this is a matter of some importance to the Bournemouth Company, is emphasized by the fact that the district for gas supply alone occupies an area of 52 square miles. The result of their experience in this matter points to the suitability of small steam-tractors, burning coke, for the conveyance of materials, such as coal and coke. That they are economical is demonstrated by the figure given—namely, 4d. per ton-mile (as compared with 1s. 4d. for horse hire) for the haulage of coke. This figure does not, however, include the cost of repairs; but according to Mr. Woodall this item should not be very heavy, for the useful life of a steam-tractor should be quite a long one, though it is desirable to write off the capital value of these commercial motors in (say) seven or eight years.

The new works at Poole, with the settings of vertical retorts, the Temperley transporter, and the general adoption of electrical power for the works, have all received a good deal of attention on the part of the Technical Press; so that it is not proposed to make any but brief mention of this scheme.

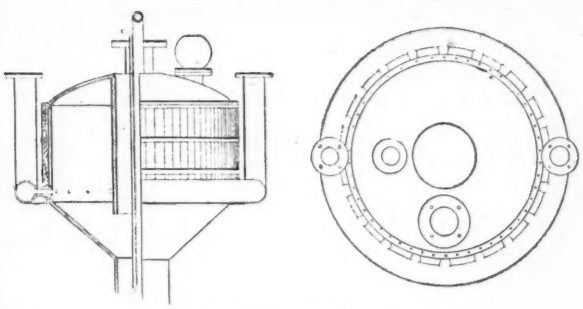
Vertical retorts have certainly come to stay; for not only can the carbonization of coal be carried out by this means in the most economical manner, but the distillation is more complete. In the first place, the process is properly adapted for the production of a larger quantity of ammonia, and it is thought that by a compromise between this system and that in use in the Mond process, a far higher yield might be obtained (90 lbs. of sulphate per ton of coal is produced in the Mond process). Secondly, the tar is richer, and without that generous proportion of soot so well known to those troubled with that bugbear of high heats, stopped pipes. Thirdly, the coke is harder and denser—an effect which always follows the carbonization of coal in a completely filled retort or oven. That the coke is improved, is evident from the experience of Herr Körting, who showed that the production of coke was considerably greater, and that of breeze correspondingly less in vertical retorts compared with horizontals or inclines. Fourthly, the process lends itself to the dilution of the coal gas by a limited admission of steam for the production of water gas. In this connection, Mr. Woodall points out that the waste heat from the coke is used to generate steam for the manufacture of this water gas.

The whole scheme for the handling of coal by a Temperley transporter is a well-conceived one, and is deserving of imitation by other gas companies similarly situated. The wholesale use of electricity for the driving of machinery is a point which is always open to criticism by gas engineers. For many purposes, more especially for stoking machinery, it is the most suitable means that can be adopted; but as regards cost it is a long way from being as economical as the direct use of a gas-engine. Mr. Woodall states that last year they generated 160,824 units of electricity at a cost per unit of 0·467d. for labour and 0·509d. for gas, or a total of 0·976d. While 1 unit of electricity will produce 1 B.H.P. per hour, or a little over, with gas at 2s. per 1000 cubic feet, it is quite ordinary working to produce 1 B.H.P. for ½d. or less; so that the extensive use of electrical power, except in special cases, needs a good deal of justification.

It is satisfactory to notice that Stirling boilers, instead of the usual but wasteful Lancashire type, have been installed at the Poole works; and that they are a success, is evident from the excellent results obtained. It is found that when the boilers are working at three-quarter load, the evaporation, with breeze as fuel, is 6·62 lbs. of water per pound of fuel from and at a temperature of 212° Fahr. It is further stated that this is an ordinary working figure, and not a special test one. Results of this kind are, of course, much superior to those obtainable with Lancashire boilers; and it is hoped that other engineers will not be behind in adopting a modern and efficient type of boiler in the erection of new works. Rather much space has been devoted to Mr. Woodall's address; but it is so unusually practical, and so suggestive of progress and efficiency, that too much could not be said in favour of both the author of the address and the work he has carried out.

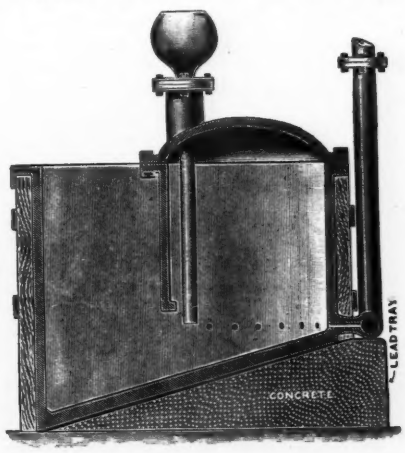
AN IMPROVEMENT IN SULPHATE SATURATORS.

In the past, many difficulties have been met with in the working of sulphate of ammonia saturators. The internal cracker-pipe, for instance, has been a fruitful source of trouble, owing to the gradual enlargement of the holes, and the breaking away of the elbow connecting the cracker-pipe to the ammonia-pipe from the stills. Hard incrustations of salt are also formed, and have to be



Williams and Fenner's Sulphate Saturator.

periodically removed; and in cases known to the writer the plant has had to be shut down to admit of its complete removal. There is also the disadvantage of the constant repairs and renewal of the distributing-pipe. In some of the best managed works, the



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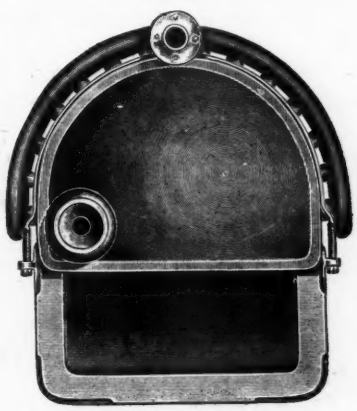


Plan.

Showing the Outside Cracker-Pipe, fitted to an Ordinary Fishing Open-Front Saturator.

appearance of an unexpected "blue salt" in the sulphate-store is indicative of some trouble of this kind, and is rarely due to a complete deficiency of acid in the saturator.

Some very interesting and extremely useful information on the formation of "blue salt" is given by Mr. R. Forbes Carpenter, the Chief Inspector under the Alkali Works Regulation Acts, both in the forty-second and the forty-third (the last two) annual reports. The conditions affecting the formation of ferrocyanides in sulphate of ammonia saturators are fully discussed; and the conclusions arrived at from a study of the conditions that determine its formation in saturator working fully support the theory that is advanced by M. Leviche—viz., that "the ammonium ferrocyanide is formed by the interaction of ammonium cyanide (or hydrocyanic acid) volatilized from the still, with ferrous oxide (or sulphide) separated in the saturator during periods when the liquor has become neutral or alkaline through deficiency of acid, or from some other cause." The acid used by sulphate manufacturers frequently contains small quantities of iron, due to very fine dust carried forward by the acid gases to the Glover tower or acid chamber. To quote again from Mr. Forbes Carpenter's forty-second annual report: "These facts lead one to expect that in any works where iron salts and hydrocyanic acid meet in the saturator, all the phenomena of 'blue salt' can be obtained by a suitable adjustment of working conditions within limits that may easily obtain in actual practice during periods of slight disorganization." The product which actually separates under saturator conditions is ammonium ferrous ferrocyanide; and its formation may be represented by the reactions:

(1) $FeSO_4 + H_2S + 2NH_3 = FeS + (NH_4)_2SO_4$.
(2) $2FeS + 6NH_4Cy = (NH_4)_2FeFe(Cy)_6 + 2(NH_4)_2S$.

Under certain conditions, the formation of this compound may take place locally. Two instances of local alkalinity are cited in the forty-second annual report. In the first case, the delivery-pipe from the still had broken off near the elbow at the bottom of the saturator, so that the usual intimate admixture of the ammonia with the acid was not taking place; and, in the second case, it was found on investigation that the holes in the ammonia distributing-pipes behind the apron of the saturator were much enlarged. In order to obviate the occurrence of local alkalinity, it is necessary that the distribution of the ammonia, steam, and other gases should be as equal as possible over the whole of the working part of the saturator, with resulting equal ebullition and uniform formation of salt. In the two instances given above, the formation of "blue salt" was directly due to the internal distributing-pipe.

In order to overcome these difficulties, Messrs. P. E. Williams and R. L. Fenner have designed and patented* an improvement in the distributing-pipe by placing this externally to the saturator, and connecting thereto by means of small pipes. With this arrangement, the steam and gas admission passages do not become materially enlarged in cross sectional area, and a practically equal pressure of steam is maintained at each orifice, and equal agitation of the acid liquor is assured. It has been found that by this simple expedient many difficulties have been overcome. One circular saturator known to the writer was fitted with an external pipe nearly two years ago, and has worked for periods of several months without a break. "Blue salt" is unknown, and no incrustations of hard salt (which were at one time a daily source of annoyance) now occur. The same distributing-pipe is still in use, and will last for years; and the cost of repairs is insignificant. The arrangement is being adopted by Mr. Charles Carpenter, of the South Metropolitan Gas Company; and a new saturator with this improved arrangement has just been started at the Holywell Gas-Works of the British Gaslight Company, and is giving much satisfaction.

Other advantages beyond those enumerated are the forcing of the salt to the place whence it can be easily removed by the discharging arrangement in use; no possibility of local alkalinity, and consequently no "blue salt;" and the increased working capacity of any saturator fitted with the arrangement.

The saturator erected at Holywell was constructed by Messrs. Biggs, Wall, and Co., who have taken up the manufacture of this improved type.

* See "JOURNAL," Oct. 29 last, p. 355.

The sixteenth James Forrest Lecture of the Institution of Civil Engineers will be delivered at the Institution, Great George Street, Westminster, on Monday, the 27th inst., by Professor Henry Louis, who has selected for his subject "Some Unsolved Problems in Metal Mining."

The death occurred on the 5th inst., at his residence in St. John's Wood Park, of Mr. Edwin Foster, who was for nearly forty years a partner in the firm of Messrs. E. Foster and Co., coal merchants, of John Street, Adelphi, and also one of the principal owners of the South Pelaw Collieries. For some years he was one of the lessees of the Herne Bay Gas-Works, and was a shareholder in many other gas companies. He was well known in the gas industry.

The recent death is announced, after only a brief illness, of Alderman F. Sudbury, J.P., the Mayor of Ilkeston. He was the Chairman of the Ilkeston and Heanor Water Board, and took an important part in the negotiations and work pending the acquisition of the Meerbrook Sough water supply; and on the occasion of the opening of the works a few years ago, he performed the inaugural ceremony by turning on the water at Whatstandwell. He was in his 66th year.

NEW GAS-WORKS AT ARNSIDE.

By THOMAS REDMAN.

THE erection of new gas-works at Arnside which are shortly to be started was begun in the summer of 1905 by a small limited Company, formed by the present owner and Mr. W. A. Turner, of Bradford. The reasons why the works were laid out on somewhat different lines from those which are at present usually adopted for works on such a scale, and why they have not yet started, will appear later. From the fact that a visitor once asked whether it was a chapel that was being built, it will be readily understood that the exterior is of an order and quality not commonly met with in gas-works in the locality; and the interior of the building is in full keeping with the outside, so far as both originality and sound construction are concerned.

Retorts.—In starting the description, let us take the retorts. These are on entirely new lines—not unknown as far as angles, &c., go, but rather because they embody the inclined and vertical systems. I quite hope to obtain to a large degree the already acknowledged benefits of the latter, though the carbonizing is done on the inclined portion; for they will receive a full charge of coal, and thus run for much longer periods between re-charging than ordinary horizontals or inclines. Notwithstanding the extremely short length (4 ft. 6 in.) of carbonizing surface, each retort will receive about 6 cwt. of coal. Of course, regenerator furnaces are employed.

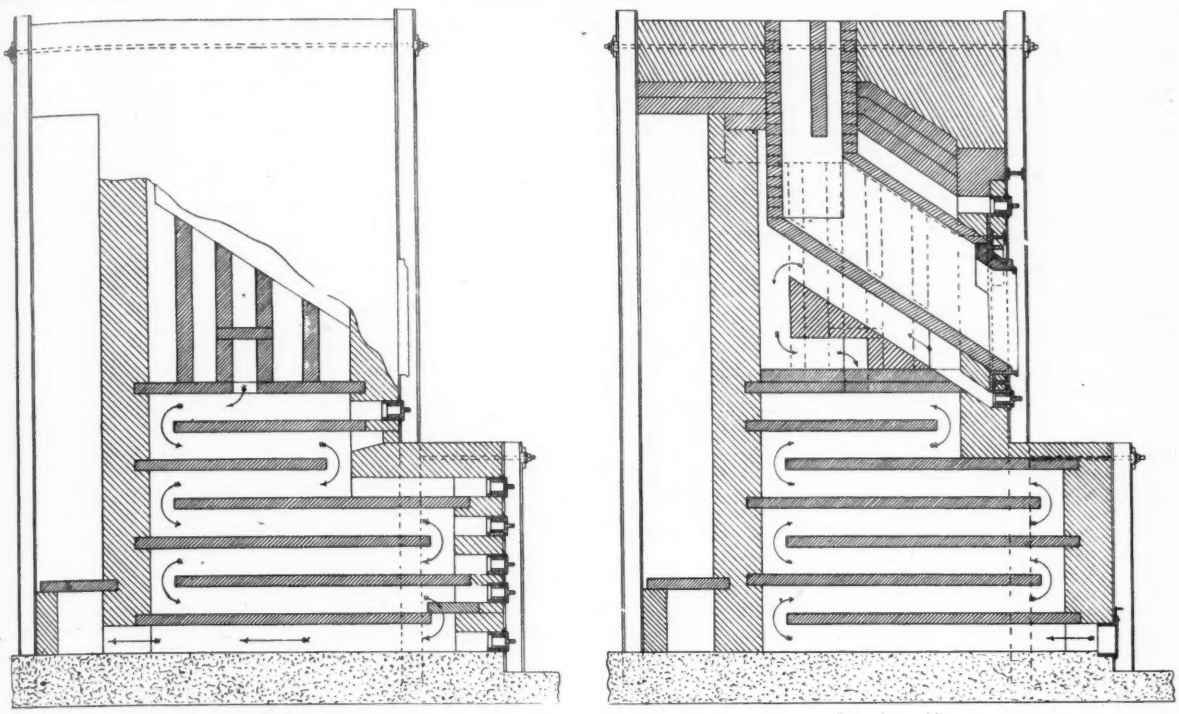
There are no ascension-pipes. The gas is taken off at the top by a horizontal ⊐-shaped take-off, placed with its flat side at the bottom. It is provided with weirs in order to retain the light tar-oils, which are returned from another and higher point in the foul mains and primary cleanser. The weir at the outlet end is the lower of the two, so that these light tar-oils flow out at that end only along with the gas to the hydraulic pot.

There is also no hydraulic main. Hydraulic pots take the place of the hydraulic main. This was necessary in the present case for more reasons than one, but mostly because it was desired to work each retort as a separate and single unit—*i.e.*, sealing and unsealing without disturbing others—and because the designer has objection to the accumulation and retaining of tar at such a point of heat as the hydraulic main generally occupies. The hydraulic pots are, therefore, so designed that it is impossible for any accumulation of stiff tarry or pitchy matter to take place without giving immediate notice. The full charge to seal, being not more than a few quarts, will therefore be entirely renewed many times over during the process of carbonizing each charge. To accomplish this, the drain-off is arranged at the apex of an inverted cone forming the bottom of the pots.

Sealing and Unsealing.—In connection with each of the pots is a hydraulic valve, so named because it provides the medium for regulating or forming the two levels of liquor, between sealing and unsealing, and also provides means for letting down the necessary quantity of liquor, together with a surplus of some three times the volume needful for sealing, which forms a good flushing arrangement on each occasion of its use. It further forms a complete stop-valve for safely shutting-off this retort unit when out of action either for repairs or renewals. After leaving here, the gas passes up a vertical pipe to the primary cleanser, which is intended to strip it of its heavy crude impurities of tar. This can be kept over to be dealt with later. The gas then enters the foul main proper, which, with the object of slow, gradual cooling, is led along the upper walls of the retort-house, where, at one end, are repeated return pipes. From this point, the fall is against the flow of gas as far back as the hydraulic pots; but finally the foul main and its fall passes through a store-room, workshop, and engine-house to a reversing multitubular condenser just outside, after which it re-enters the engine-house and passes through the exhauster.

Steam-Jet Exhauster.—The exhauster is not of the well-known two, three, or four blade rotary type, but a Körting's steam-jet exhauster, worked, not by steam, but by compressed gas; the designer being aware of the enforced waste of the liquor by the use of these exhausters when steam is employed. Hence the use of compressed gas, the object of which will be fully explained presently.

Rotary Washer-Scrubber.—The gas now passes along from the exhauster to a rotary washer-scrubber, in which an entirely new system is adopted in the method employed to induce or secure the most thorough extraction of ammonia; one of the features of the washer-scrubber being to so construct the drums and arrange the washing and scrubbing medium, that there is no friction with it in connection with any of the partitions. Therefore contact or friction joints are non-existent therein. In lieu thereof, all the drums are so arranged that they form pumps; and to prevent any chance of slip or short-circuiting of the gas, the speed will be such that each drum will be pumping through it any predetermined or desired quantity in excess of the actual make—thus pumping back a portion of its discharge, while the major part proceeds to the next drum. The gas enters the drums at the sides nearest the inlet, and is expelled at their peripheries. The necessary power to drive will be very light, and all risks and breakages will be minimized; for, in addition to the above, the whole of the revolving parts are carried on simple, easy, accessible, adjustable roller-bearings. A full description of the interior parts will be given later.

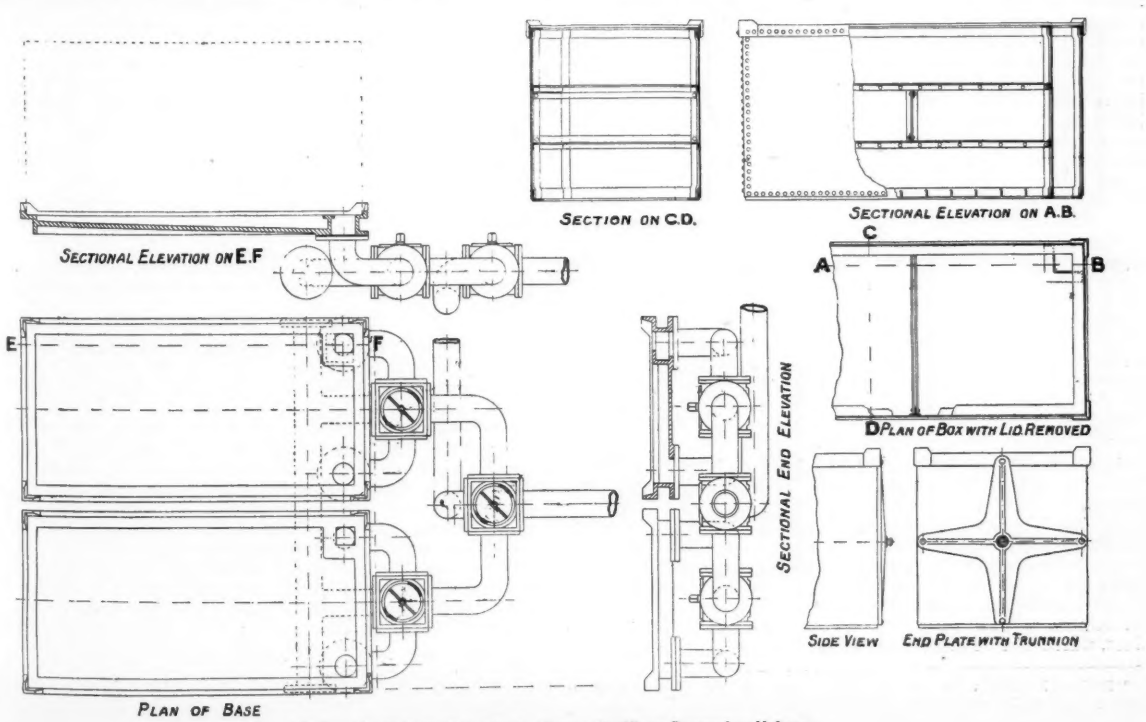


Redman's Patent Retort-Setting.

Re-Heater.—This is a departure from ordinary lines. After leaving the washer, the gas may, when desired, be conducted through a re-heater—an arrangement made to warm the gas in extremely cold weather—before it enters the oxide purifiers, which are placed in a shed, open almost due east, with the retort-house wall at the southern end, thus completely shutting out all possibility of the sun's rays.

Bye-Passing.—The bye-passing of the five appliances dealt with thus far is done by a single valve in each case. This one valve, in connection with the condenser, it must be remembered, also reverses the flow at will through that apparatus. This is accomplished by simply turning a valve-handle 90°.

Tower Purifiers in Loose Moveable Sections.—I may now come to the oxide purifiers. Here, again, is another radical change in the system employed in the arrangement of the boxes, which are intended for oxide. The choice and variation in the working of these is nearly endless; while the objects and benefits sought after are almost equally so. In the group there are five boxes, or box-shells, each consisting of sides and ends only, without bottoms and tops. These are portable, and provided with suitable means for lifting them to a position for emptying—not by the usual method of shovel and pick, but by revolving the whole box bodily. The oxide is deposited in a suitable hopper for revivification, particulars of which are given further on. There are two base plates, upon which stand two shells or boxes, each making two towers of two boxes each. Any proportion of the unit of four boxes out of the five may be in use; and by the mere manipulation of one valve the whole contingent may be bye-passed or reversed in their order of flow, while another pair of valves acts likewise on two boxes each. This arrangement of a nest of three valves, all of which will bye-pass and reverse, affords a choice of changes in the working of the boxes hitherto unknown, and which will, I believe, prove to be a record. Another accomplishment is that any box in the four may be put first or last or into intermediate positions, or they may be bye-passed in pairs. The use of the fifth box will have exercised the minds of the practical readers long ere this; its use and objects being so numerous. They are: (1) To act as a stand-by box, which can be charged ready for taking the place immediately on the removal of the next foul one, the planting of a fresh box being a few minutes' work only, when the full unit of the four boxes may again be in full work, and, if necessary, the spare or fifth box may also be put into working use. The whole of the purifiers are interchangeable and made to stand one upon another—hence



Redman's Patent Gas-Plant—Tower Purifiers Reversing Valves.

their name "Tower Purifiers." (2) To enable the spare box or shell to stand by with its full charge of fouled material, in such a manner that suitable and complete revivification may be put in progress.

Now to pick up the thread of this narrative where the foul box was lifted, travelled, and revolved for the purpose of emptying. This process takes place over a hopper suitably formed at close quarters with the suspended box in the travelling crab. The material may be retained in the hopper or distributed at will; but on its release, it gravitates down a vertical revivifier formed by a series of intersecting cross plates and louvres which are provided with stopping arrangements at various parts, so that the material may be let down at suitable stages and times, while in this revivifier the material is to a large extent in suspension and free from the objectionable disabilities of lying in bulky stagnant heaps or layers on a solid floor in which—except the outer surface or skin which can be said to be revivifying—is a mere fraction of the bulk and is at a great disadvantage for want of slow through ventilation. By this crude method, the revivification can never be as complete as it should be, without excessive expenditure in labour. Hence the attempt at improvement. The gas, on leaving the oxide purifiers, travels on past the revivifying stage and charging floor, and enters a lime purifier of the ordinary type, which again is put on, reversed, and bye-passed at will by one valve only. The gas on leaving here passes to the station-meter, which is of the ordinary type, and is bye-passed by one valve instead of three.

Gasholder.—This is of strange dimensions for a works of the present capacity, as it contains but little over 500 cubic feet. It is the only holder on the place, and acts merely as a receiver between the compressors and the high-pressure receivers, of which there are five in a stack, forming ample storage capacity for some time to come. On leaving this point, the gas is reduced in pressure, and passed through the carburettor, in which process it regains its candle power lost by the compression, but without the impurities and watery vapours also precipitated by the action of compressing; the latter forming advantages of very considerable value to the consumers.

(To be continued.)

REMOVAL OF FLUE GASES FROM GAS-FIRES.

It will perhaps be remembered by most readers that for a good many years past the members of the Heating Committee of the German Association of Gas and Water Engineers have had under consideration the drafting of a code of rules for the construction, erection, and manipulation of gas-heating apparatus, and that about a year ago they issued a provisional set of regulations having this object in view. It is manifest that the conditions obtaining in the chimneys or flues connected with gas fires and stoves vary very much. Hence it is not altogether surprising that totally different opinions have been passed regarding the correct method of designing such flues. These differences of opinion have become very conspicuous at one time and another—for example, in the suggestions offered some years back by Professor Rietschel, and in the paper read by Herr Schäfer (who is a member of the Heating Committee) at the meeting of the German Association held in Coblenz in 1905. Many of the principal differences were undoubtedly reconciled in the provisional code prepared by the Heating Committee; but several points remain to be elucidated—more particularly with reference to the propriety in very troublesome cases of down-draught and the like, of inserting in the flue a deflector so as to prevent the combustion products being blown back into the stove. In order to assist in clearing up the whole matter, the Heating Committee recently requested another of its members, Professor Junkers, of Aachen, to prepare a set of models and a paper exemplifying and discussing the mechanism of the removal of combustion products from gas-fires. This task he has kindly undertaken and brought to a conclusion. The models have been recently shown at the Health Exhibition held at Berlin; and the paper has been reproduced in pamphlet form and distributed gratis among interested persons. At the close of the exhibition, the models are to be sent to the experimental laboratory of the German Association at Karlsruhe, where they will be kept and used in the training courses for gas engineers which are held there. The pamphlet itself, together with a description of the models, has been published in the "Journal für Gasbeleuchtung," from which we derive the following account of both.

Models.

Among the many working models which have been prepared by Professor Junkers, in the manner described above, the following may be mentioned.

(1) The first of the models consists of a miniature house. It is constructed to resemble a double-fronted, two-storey dwelling, with a ridge-roof, having a set of skylights and windows in the gable ends. The windows are designed on the single casement principle and open inwards.* In the different rooms of the house miniature gas fires or heating stoves are installed with adjustable flues, which can be altered so as to pass through the roof, into the roof-space, or horizontally through one of the walls. At various points in the house connections are fixed, to which a rubber tube leading to a sensitive pressure gauge can be attached; so that any surplus or deficient atmospheric pressure obtaining in the room can be recorded. The house is used in conjunction with an electric desk fan, which, set in motion by current in the ordinary way, produces phenomena resembling those prevailing when a natural wind of variable strength beats upon a house at any particular angle.

(2) A second object consists of a full-sized reflecting gas-stove with luminous flames, and fitted with a rectangular flue. One side of this flue is composed of a metallic plate, polished on the inside and cooled on the outside by a current of water kept constantly flowing through an appropriate chamber. The opposite side of the flue is glass; and at short intervals through the side walls thermometers are inserted to show the temperature of the ascending gases. The glass plate in front enables an observer to see at what temperature and in what position water is deposited in a liquid condition upon the polished metal plate.

(3) A third model consists of the experimental chimney designed some 30 years ago by Professor Meidinger for exhibiting the different phenomena of chimney draught. It is composed of a concentric double vertical pipe with three lateral openings at different heights, at the mouths of which lighted candles can be supported. The annulus of the chimney can be cooled or warmed by filling it with water at any desired temperature.

(4) A fourth model contains a flame burning under the lower mouth of a chimney placed within a rectangular chamber, two opposite sides of which have openings, while the back and front are closed. This is made to revolve on a stand so as to show the effect produced by a wind blowing at right angles to, or parallel with (or, indeed, at any other angle with) an open window in a house.

(5) A fifth model is one having a gas-flame burning in a perfectly closed chamber, both the inlet and outlet of which pass through a vertical partition resembling the wall of a house.

(6 and 7) The sixth and seventh models are a pair of reflecting gas-fires, one of which is designed in accordance with the suggestions made by the Heating Committee of the German Association; while the other infringes the rules laid down. These fires are not further described in the present article; but the second apparently contains certain channels through which the gas travels in a downward direction, in such conditions that a down-draught in the flue probably interferes with perfect combustion, or causes the combustion products to escape in quantity into the apartment; whereas the first is presumably so constructed that a down-draught cannot be followed by any of the objections mentioned.

(8) This model is a reflecting gas-fire connected with a flue having a deflector in it such as is shown in section by fig. 5 reproduced herewith.

Besides these models, various curves, and also a set of drawings in plan or elevation showing the manner in which the natural draught of a chimney is increased or decreased by wind, &c., are included in the collection. These diagrams will be incidentally referred to later on.

The Junkers Pamphlet.

After a brief preface, in which the author points out that the great convenience of gas-heating apparatus is liable to be outweighed if the stoves are so erected as to allow the escape of combustion products into occupied rooms, more particularly when conditions are such that the waste gases contain products of imperfect combustion, and that the prevention of these troubles is chiefly to be obtained by the better technical instruction of the fitters whose business it is to erect gas-fired apparatus, Professor Junkers comes to the true subject of his pamphlet. His primary object, which we now proceed to abstract, is to discuss the real functions of the flue affixed to a gas-stove, the various circumstances that are liable to interfere with its action, and the different devices that can be adopted in order to prevent such interference.

Chimney Phenomena.

If a gas-stove is to work satisfactorily, it is necessary that the supply of air shall be sufficient to avoid all possibility of imperfect combustion, but shall not be so large as seriously to decrease the efficiency of the apparatus. The phenomena of combustion are regulated by the draught in the fire. A coal-fire requires a chimney to establish this draught; but a gas-fire provides its own. A gas-fire therefore will burn properly without any chimney; and the only reason for using one is that the products of combustion must be carried away. It is not only unnecessary for the flue of a gas-fire to produce any draught, but it is necessary that the flue shall not produce any effect upon the draught established by the stove itself—neither increasing nor decreasing it in the smallest degree. In order to study the conditions prevailing in a flue, and to consider how the stove may be rendered independent of irregularities in the draught set up by the flue, it is desirable to note: (1) The effect of composition and temperature upon the ascent of the combustion products; (2) the influence of reduction in the temperature of the gases within the flue; (3) the action of wind upon the draught; (4) methods for preventing the flue exerting a prejudicial influence on the natural draught of the stove.

Effect of Composition and Temperature.—In order that the combustion products may be carried away at the proper speed,

* It should perhaps be explained that wherever the word "window" occurs in this article, a single casement opening inwards is to be understood.

a certain amount of energy is required to overcome the resistance in the flue. This energy is derived from the ascensional force of the products; and depends on the weight of the gases in the flue, which is a function of the height of the flue, and the specific gravity of the said (waste) gases. The specific gravity of the gases depends upon their temperature and composition; the latter being largely affected by the amount of air which is mixed with the true products of combustion rising in the flue. Reference to the curves in fig. 1 will show that at any given temperature the

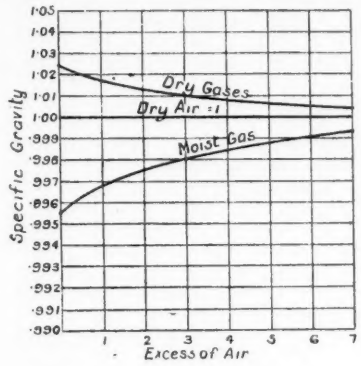


Fig. 1.

specific gravity of undiluted combustion products from a gas of normal composition is less than that of air if they are saturated with moisture, but is greater than that of air if they are dry; and that, as the proportion of air mixed with them increases, the density of the moist gases increases, whereas that of the dry gases decreases, until they both approach the density of dry air itself. In other words, the removal of water vapour from the combustion products increases their specific gravity and diminishes their ascensional force. The phenomena of condensation can be well exemplified by means of the model apparatus (No. 2), described in the early part of this article. By its use, it can be seen that the deposition is mainly dependent on the temperature of the walls of the flue and the dew-point of the gases, having little to do with their temperature. The dew-point is a function

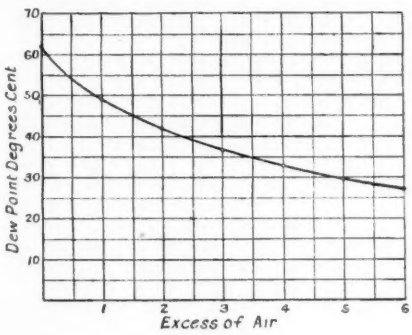


Fig. 2.

of the excess of air, varying inversely with that excess. Hence an excess of air prevents the condensation of water, and is, accordingly, advantageous both in maintaining the ascensional force and in preserving the inner surface of brick chimneys from injury by condensation. The effect of excess of air in the combustion products upon the dew-point is shown diagrammatically in fig. 2.

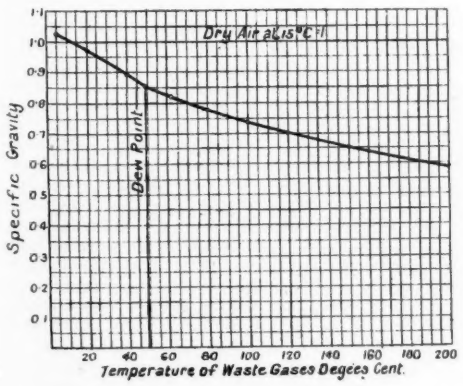


Fig. 3.

Effect of Temperature.—Fig. 3 shows the relationship between the specific gravity at various temperatures of the combustion products containing an equal volume of air and the specific gravity of dry air at 15° C. On comparing this with fig. 1, it will be manifest that the specific gravity of the waste gases depends more upon the temperatures prevailing in the flue than upon the composition of the gases. The active temperature, however, is the mean temperature, not the temperature at the inlet. This point is specially to be noted, because a reduction in the temperature of the gases at the inlet of a flue, brought about by the introduction of some air there, does not necessarily involve a reduction in the mean temperature of the gases within the flue.

Effect of the Flue Walls.—The effect of the comparatively cool walls of a flue or chimney upon the rising gases is to remove heat from them, and therefore to diminish their ascensional force. From a properly-designed flue, the gases escape at a temperature still exceeding that of the surrounding atmosphere. If the chimney, however, removes so much heat from the gases that they fall almost to the temperature of the air before issuing from the top, water may be condensed, so that the residual gas becomes heaviert han the air, and the draught of the flue is damped. If the walls of the chimney or flue are cooler than the air, as may happen during a very hot day after cold weather, or when the sun is sharply heating the atmosphere, a definite down-draught may be produced in the chimney, and the current may be established in a descending direction. All these phenomena can be readily demonstrated by the model (No. 3) made by Professor Meidinger and mentioned above.

Effect of Wind.

An examination of the curves such as are to be found in text books on meteorology, representing the pressures exerted by winds travelling at different speeds, will show clearly that the pressures in question greatly exceed the aspirating power of any chimney filled with combustion products at a moderate mean temperature. To give an example, the draught set up by a chimney 25 feet high, filled with gases at the mean temperature of 100° C., is only about one-eighth of the pressure produced by a wind travelling at the rate of 8 metres per second (roughly, 17 miles per hour). If, therefore, only a very small fraction of the force exerted by a wind acts prejudicially upon the draught of a chimney, the ascent of gases in it may be hindered or converted into a descent. If, now, a domestic heating apparatus, composed of stove and chimney, is so erected that both the top and the bottom of the chimney are equally exposed to wind, no practical interference with the action of the chimney is likely to result; but if one end of the flue is more exposed than the other, the effect may be either an increase or a decrease in the draught. The latter is the case which most usually obtains in houses, as the stove is placed in a closed room while the mouth of the chimney is in the air. It is, however, necessary to consider four systems of arrangement which differ according as the chimney (I.) extends vertically upwards through the roof of the building into the open air; (II.) passes through a side wall of the house into the open air and points in a horizontal direction; (III.) passes through an inner wall of the house and opens horizontally in some adjoining apartment or passage; and (IV.) points vertically upwards, but terminates within the roof-space of the dwelling. In these cases, the working of the apparatus depends partly on the direction of

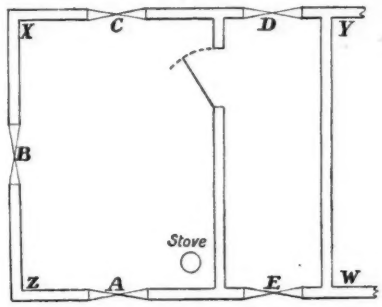


Fig. 4.

the wind and partly on the question whether any, and if so which, of the windows in the house are opened. In order to consider the various phenomena more nearly, fig. 4 may be studied.* This figure indicates in plan a room and landing, or passage, in an ordinary house. The landing has two opposite windows, marked D and E respectively; while the room has three windows, A, B, and C, and a stove in one corner.

Case No. I.—In this instance, the flue is supposed to pass through the roof well above the ridge. If the wind blows in a direction parallel with the wall X Y, and all the windows in the room are closed, the draught will be satisfactory; but if the window C is opened, the movement of the air outside will aspirate air from within the room and cause a down-draught. The trouble will be greatly aggravated if there is a wall belonging to some adjoining house near to, and parallel with, X Y. If, however, C is closed and B is opened, the pull of the chimney is increased instead of being diminished, because the wind then blows directly

* We have prepared fig. 4 in order, as far as possible, to represent on one diagram the numerous sketches given by Professor Junkers in his pamphlet, as space does not allow us to reproduce them all.

into the room. If the chimney rises above the ridge of the roof in the manner described, but is nevertheless below the roof of some contiguous building, the wind blowing against the side wall of the taller house may stop the draught; and if the flue is fitted with a revolving cowl, the wind blowing against the next building will simply turn the cowl until its open mouth points towards the brickwork, so helping the reflected wind to pass downwards to the stove.

Case No. II.—If the flue pipe of the stove is bent at right angles and made to pass horizontally through the outside wall Z W of the house, wind blowing directly against this wall will stop the draught of the chimney; but if the window A is opened, the pressure of the wind will be exerted equally at both ends of the flue, and the up-draught will be restored.

Case No. III.—If the flue pipe of the stove is bent at right angles as before, but is made to pass through the wall between the room and the landing, so that the products of combustion escape into the latter, considerable difference in the behaviour of the stove will ensue according to the position of the windows in the landing. For instance, if the wind beats upon the wall X Y, and the windows D and B are opened, the stove will "smoke." If D and E are opened but all other windows are shut, the draught will be increased; while if C and E are opened, the up-draught will be stronger still.

Case No. IV.—If the flue-pipe of the stove extends vertically upwards into the roof-space of the house without penetrating the tiles, and the wind blows as before against the wall X Y, the opening of any dormer window above C or D will interrupt the draught; but if, while the window in the gable-end over C is opened, some skylight or dormer window above B is also opened, the draught will remain normal.

Remedial Measures.

In the code of rules already drawn up by the Heating Committee of the German Gas Association, various devices have been proposed for preventing any down-draught in a flue from interfering with the perfect combustion of a gas fire or cooker. In the case of a reflecting gas-fire, it is suggested that the pipe from which the unburnt gas escapes shall lie towards the back of the stove; the flames being deflected forwards and horizontally by the horizontal upper end of the ordinary reflector. In these conditions, any blast of air coming down the flue passes straight out of the open mouth of the fire without impinging on the flames. In the case of a ball fire, the canopy is kept well above the highest balls and the tips of the flames, so that the latter are not distorted by any down-draught. A somewhat similar arrangement in which annuli containing water are used as deflectors is recommended for application to a geyser—any down-draught escaping through holes arranged in the casing of the apparatus. For cooking-stoves, it is suggested either that a deflector like that shown in fig. 5 should be inserted in the flue, or else the flue should be made in two portions, the lower one provided with an ordinary conical cap entering loosely into the mouth of a socket-like expansion on the upper half of the flue. Various modifications of these plans at once suggest themselves. The device shown by fig. 5 has the advantage over many others that the conditions prevailing in the flue do not affect the natural draught of the stove. The use of any of them prevents a down-draught from so interfering with the combustion that carbon monoxide is evolved, but naturally does not prevent the delivery of combustion products into the room where the stove is situated. In the very worst cases, where it seems impossible to provide a trustworthy draught by other devices, the gas required for heating purposes may be consumed within a totally enclosed space, the air inlet to which, as also the outlet for the combustion products, pass through a wall into the open air, or elsewhere, one above the other, and point in the same direction. Constructed in this manner, both the inlet and outlet are equally exposed to wind, and are therefore unaffected by it.

Fig. 5.

Conclusions.

Dr. Junkers concludes by stating that the following lessons can be learnt from the models and apparatus he has prepared. The chief feature which determines the ascent of combustion products in a chimney is their mean temperature, although, if the excess of air is not large, the separation of water from the products within the chimney interferes with their rise. If the excess of air is large, condensation of water vapour has very little influence. The separation of water vapour in a flue is mainly dependent upon the dew-point of the gases and upon the temperature of the flue walls. It is less affected by the temperature of the gases themselves. Deposition of water can be reduced by increasing the excess of air without of necessity diminishing the pull of the flue. The absorption of heat by the flue itself affects the draught more or less unfavourably. According to the difference in pressure exerted at the inlet and outlet respectively, wind may increase or retard the draught, even in a well-designed flue. Cowls cannot be altogether relied upon to prevent the harmful effect of wind. Conducting combustion products either into an adjoining apartment, into the roof-space, or through the side wall of a room directly into the open air, does not always act well, and is a plan which should be avoided whenever possible. In order to prevent the flue exerting any harmful influence upon the draught of the stove, a suitable deflector (such as that shown in fig. 5) should be applied to the flue as close to the stove as possible. It must be so used that any descending products cannot mingle with the fresh air which is on its way to the flames. Finally, the best manner of avoiding all flue troubles and the escape of combustion products is to make use of the closed chamber having an inlet and outlet adjoining one another in the open air.

A SMALL GAS CALORIMETER.

In a recent issue of the "Journal für Gasbeleuchtung," Dr. M. Stoecker and Herr W. Rothenbach, of Karlsruhe, give a description of a calorimeter they have designed which is said to be more accurate than the Hempel instrument, and to be available for use with smaller volumes of gas than are required when employing a Junkers apparatus.

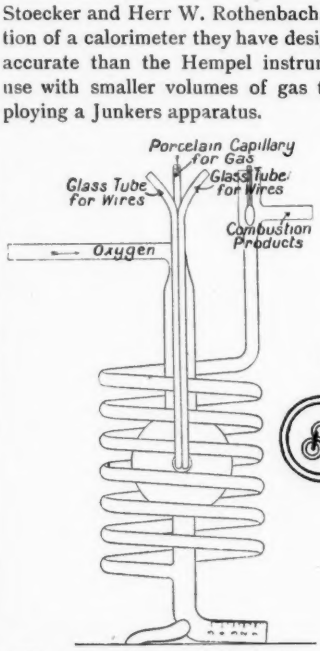


Fig. 1.—Stoecker and Rothenbach's Calorimeter.

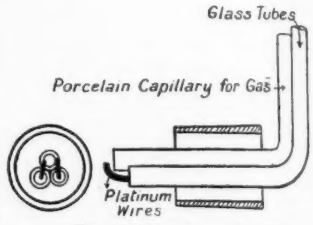


Fig. 2.—Burner and Igniting Arrangement.

As shown by fig. 1 herewith, the essential part of the calorimeter consists of an upright glass tube, 2·5 cm. in diameter, expanded in the middle into a bulb. The upper part of the tube is contracted to a diameter of 8 mm., and bent at right angles. The lower end of the tube is also narrowed somewhat in diameter, bent at right angles, graduated into divisions representing 0·1 cc., and employed to form one of the feet of the instrument. At a height of 5 cm. above the base, the coiled condensing tube is sealed into the former glass tube. The condenser is 2·5 metres long and from 8 to 10 mm. diameter. At the further end, the condenser is attached to a T-piece, the horizontal outlet of which is used for the removal of the combustion products; while the vertical mouth carries a Beckmann thermometer. A lateral neck is fused into the side of the bulb of the main tube about half way up, into which a brass sleeve is accurately ground. This carries the system of tubes through which the gas burned in the calorimeter and the wires conveying a current of electricity for its ignition are passed. These latter tubes are shown more distinctly in fig. 2. The gas enters through a capillary tube of porcelain, alongside which are two glass tubes, each conveying a wire for the current. At the lower end, the glass tubes terminate at a point from 3 to 5 mm. short of the porcelain tube; platinum ends being attached to the leading wires, and curved upwards in front of the mouth of the porcelain, so as to yield a spark about 2 mm. long. These three tubes are fixed into the brass sleeve by means of a putty composed of litharge and pure anhydrous glycerin. The ends of the glass tubes are sealed up, and filled up with a putty of rosin throughout their length. The horizontal upper part of the central tube is used for the introduction of oxygen.

The whole piece of glass apparatus is placed in a vessel containing water constructed in the manner designed by Mahler; the quantity of water being so calculated that it rises in temperature by one degree for every 4500 large calories absorbed. The apparatus is adjusted in this particular respect by carrying out in it some eight different combustions of chemically pure hydrogen, and taking the mean of the values so obtained. An agitating device is fitted to keep the water in motion during the test. The gas to be burned is collected in a one-litre glass balloon like that employed by Junkers for verifying gas-meters. The balloon is also placed in a vessel of water. On its way from the balloon to the calorimeter, the gas is caused to pass through a piece of capillary tubing 0·8 mm. in diameter, and 35 cm. long. These dimensions are such that, when all the cocks are fully opened, the gas yields a flame 1·5 cm. long. If gases of other composition

than that for which the calorimeter is primarily designed have to be examined, a different capillary is employed; so that the flame may always have approximately the size specified. The oxygen (derived from a cylinder) passes through a reducing valve, and then a washing bottle charged with water. The device employed by Hempel is used, so that roughly the same volume may always be admitted to the calorimeter. In order to make more certain on this point, however, a capillary tube, 15 mm. long by 0·8 mm. in diameter, is inserted on the inlet to the calorimeter.

The apparatus is used in the following manner: The gas-measuring vessel is filled and its contents are reduced to atmospheric pressure by a momentary opening of the proper cock. The temperature of the water that surrounds it is also noted. The temperature of the water in the vessel round the calorimeter is adjusted, following the plan originally suggested by Rumford, to such a point that at the beginning of the test it is about as much below that of the atmosphere as it will be above the atmosphere at the end of the test. The agitator is set in motion, the current of oxygen is turned on, and the temperature (indicated by the Beckmann thermometer) is read every minute. When the rise in temperature becomes constant, four more readings are taken at intervals of one minute, as before; so that figures are obtained showing the amount of heat absorbed by the water from the surrounding air. At the expiration of the fourth minute, the induction coil communicating with the wires is set in operation, and the gas in the measuring vessel is put under pressure from an elevated reservoir. Immediately after the fifth reading of the thermometer, the gas is admitted to the calorimeter, where it is fired by the spark. The induction coil is thrown out of action as soon as the flame appears. The combustion is then allowed to proceed, and the thermometer is read, as before, every minute. After about five minutes, the one litre of gas is completely consumed, and the flame goes out. The supply of oxygen is cut off; but the agitation of the water that surrounds the calorimeter is continued about another five minutes; the thermometer being read every minute as before.

In making the calculations, the mean rise in temperature of the thermometer per minute, both before and after the combustion proper, is obtained, and the geometrical mean of the two is taken. [Obviously, the rise in temperature before the test is positive; that after the test is negative, owing to the cooling action of the air on the warm water surrounding the calorimeter tube.] The temperature shown by the thermometer at the beginning of the combustion is deducted from that at the end of the combustion, and from the difference is subtracted the radiation factor previously deduced in the way described. This second difference is the actual rise in temperature of the calorimeter, which, multiplied by the water-value of the apparatus—*i.e.*, 4500 large calories—gives the gross calorific value of the gas burnt. The net calorific value is found from the Clausius formula—

$$w = 607 - 0{\cdot}708\,t$$

where t is the mean temperature of the combustion products.

The authors admit that their calorimeter has the inconvenience of requiring the simultaneous services of two observers. They state that it has not been designed for the precise determination of the calorific values of gaseous fuels, being intended rather as a convenient instrument for rapid estimations of the heating power of small volumes of gas. Nevertheless, if due precautions are taken to eliminate the more obvious sources of error, the figures given by it are quite trustworthy. Even in the worst conditions it affords readings never differing by more than 1 per cent. from those of the Junkers instrument; so that the probable error may be said to be $\pm$ 0·5 per cent. The authors also claim that as a spark only 2 mm. long is quite capable of firing a mixture of oxygen or air with any inflammable gas, and as it is allowed to pass only for an exceedingly brief interval of time, the amount of heat introduced by the spark is so small as to be negligible. It is preferable to use an actual spark passing through air in place of a short length of incandescent platinum wire for firing the gas, as the wire would inevitably be fused by the heat of the flame.

Electric Light and Eyesight.

In the "JOURNAL" for the 31st ult., in the course of an article on "Artificial Lighting and Eyesight," it was mentioned that two German investigators had come to the conclusion that eye-troubles are caused by the ultra-violet rays emitted by light sources. As these rays prevail in the electric light, while in the gas-flame the red and yellow rays are most prevalent, it has been held by some medical men that the latter are much less hurtful to the eyes than the former. This is the opinion of an eye specialist, as communicated to the "Daily Mirror" last Wednesday. He stated as follows: "The violet and ultra-violet rays are strongly chemical rays; and as in an electric battery we can get electricity from chemical action, so the chemical action of the violet rays on the eye sets up electric disturbances there, which lead in many cases to weakened eyesight. This weakness of eyes is very common among those who work in offices lighted by electricity. The electric disturbance created in the eye by the violet rays can be measured by an instrument known as the capillary electrometer, which is so sensitive that if it is connected with an eye excised from the body, and light is allowed to fall upon the window of that eye, the electric disturbance caused by the various rays of light directed upon it will be notified. Gas light has, on account of its red and yellow rays, a stimulating effect upon the mind, which the electric light lacks, since in it the colder violet rays predominate."

VICTORIAN GAS MANAGERS ASSOCIATION.

Second Annual Meeting in Melbourne.

This meeting was held last November under the presidency of the Hon. GEORGE SWINBURNE, Assoc.M.Inst.C.E., the Managing Director of the Colonial Gas Association, Limited—owners of the gas-works in nine towns in Australia. After some preliminary business (a report of which will appear next week), the meeting settled down to hear the

President's Address.

To the Members of the Victorian Gas Managers Association:

Gentlemen,—It is with much pleasure that I welcome you to our Second Annual Meeting. I trust you come well primed for the discussion of important subjects; for this is a splendid opportunity for many of us who have been practically isolated during the year.

First of all, however, I should thank you most heartily for the honour you did me in electing me your second President—to succeed so old and eminent an Engineer as Mr. R. O. Thompson, who had the privilege of launching this Association on its (what may be) historic career, and which I hope will be long and useful. We, in Australia, are like many of our brethren scattered over Europe and in foreign lands at great distances from each other, and therefore much alone. We have not the advantages of the managers and engineers in the old land, of being able to consult with our neighbours a few miles away, or receive the help of a contractor or manufacturer of specialities in gas-works plant to carry out our work. We are compelled to think out our difficulties for ourselves, and develop our work under often original and peculiar conditions.

Most of our works in Victoria and throughout Australia are small; and the manager in by far the majority of instances has to himself study the work of gas manufacture and distribution from the carting of coal into the works to the ventilation of rooms and the lighting of streets, the mechanism connected with gas as a motive power, and by his suave and persuasive ways display the superior qualities of the gas-stove as the best and cheapest of cookers.

Many of us look up with pride to the chiefs of our profession, who achieve notable success. Sometimes we are envious at their being able to carry out works with such ease, and on such a large scale that work can be completely subdivided. But we are consoled by the fact that it takes a really clever man also to run smoothly all the multitudinous affairs of a two-million-a-year works. The man who understands retort-house work, purification, the *minutiæ* of distribution; who does all his own fitting; sees that the street lighting is carried out to the satisfaction of the Municipality; collects all his accounts for gas, tar, and coke; and, finally, balances with his banking account—is a man of many parts. A manager of a small gas-works must be an all-round engineer, a good business man, and full of tact, not only to be successful in his work, but to extend the consumption among all the varied classes of consumers with whom he daily comes into contact. In fact, I might say—with most humble apologies to our members who control large undertakings—that I have a growing and greater respect for the man who alone, and living apart most of his life, carries out with wonderful personal resource the great and varied duties of his profession in so many cases with eminent success. Our work must more and more depend upon personal fitness. The manager and engineer can make or mar the whole business. Even bad retort-house work can, as you know, turn a profit into a loss; and a large unaccounted-for gas account, with rising prices of coal, can seriously cripple a company.

These annual meetings should enliven our daily task and help us enormously in our work. As most of our members are engaged on works with an output of under 10 million cubic feet of gas, and many under 4 millions a year, it is well for us to devote a considerable portion of the time at our disposal to questions relating to the difficulties and work of small undertakings. As you know, I am connected, as a Director, with the Metropolitan Gas Company, and thoroughly enjoy the problems of so great an enterprise, which turns out nearly 6 million cubic feet of gas per day. I am, however, with the majority of you, essentially a small-works man; and most of the works—such as Ararat, Bacchus Marsh, Benalla, Shepparton, Wangaratta, Waragul, Maldon, Seymour, Bairnsdale, Box Hill, and Sandgate in Queensland, Mount Gambier in South Australia, Albany and Geraldton in West Australia—with which I am connected, do not produce as much gas in a year as the Metropolitan Company does in one single day. Box Hill is the only exception; and that is approaching 10 million cubic feet per year.

It would seem that there is hardly a town in Victoria without gas that would pay for the reticulation of the streets; in fact, there are a few that would find it difficult to pay their way—the towns and consumption being too small. Any town that will not consume 2 million cubic feet per annum is hardly worth handling; and it becomes almost amusing to find some of our municipalities which possess gas-works that barely make a profit, calling for tenders for electricity. Of course, the councillors do not know anything about the business. No town of under 20,000 inhabitants can support a gas and electric light works; in fact, I should never advise the installation of a gas-works if a town was lighted by electricity unless the population was over 20,000, and had a good

business centre, or an expenditure for electricity if a gas undertaking was already in the field—it is simply waste of capital, and means ruin to one or the other. There must, however, be a growing effort made to give the best value for the price charged. With every part of the apparatus used (from the bricks to the meters and fittings), becoming more expensive, and coal steadily rising in price, it is more difficult to reduce the rates charged for gas. Courage as well as caution is, however, needed. The advice may sound a little Scotch; but it is essential in most of our small works, as well as in our large undertakings. Although no gas company has a monopoly absolutely, it may have in a restricted sense, inasmuch as it will not pay in every case for a second lighting company to instal plant or expend capital.

Melbourne, Ballarat, Bendigo, Geelong, and Hamilton have both gas and electricity—the latter being carried on with varying fortune in the last-named places, proving my contention in every way. But generally the gas company has only to compete with kerosene. As kerosene is used by the great majority of the people of the State, it is essential, although an imported article, with the bulk of the lamps and burners imported as well, to bring it in at a low duty, because it will not pay to supply gas or electricity except in really populous centres. Gas, which is made from Australian coal, manufactured in Australian retorts, set in Australian fire-bricks, built in a retort-house of Australian manufacture, delivered through cast-iron pipes made in Australia, measured by meters now put together in Australia, and burnt in fittings largely made in Australia, has for its principal competitor kerosene oil hitherto admitted free, and now still on the free list if brought in in bulk.

According to the proposed tariff, we further see the peculiarity of a great preference given to some electrical apparatus. A protectionist Government actually raise the duties on apparatus used for gas manufacture, but admit electrical plant, in some instances, free. No explanation is forthcoming for such a preference. It would seem that the Federal Government was anxious to help the development of electricity, but at the expense of the manufacture of electrical apparatus in Australia—to develop electric light by admitting some apparatus connected with it at low duties, and by penalizing the gas industry by high duties. Our Australian retorts, pipes, &c., are of excellent manufacture, but, of course, are higher in price on account of the higher wages paid. Our energies are bent on supplying good gas at a cheap rate; and the public continually cry out for reductions. But if we are deliberately placed at a distinct disadvantage compared with competing illuminants, and in addition find everything we use rising steadily in price, it is difficult to carry out our aim with regard to rates and charges. A protest has already been forwarded to the Minister of Customs on the matter; but a resolution will be submitted to you to-day which, if approved of, will be forwarded to him from the Association.

In spite of all the disabilities under which we are labouring with high-priced coal and material, I have been able, owing to increased consumption, in some places to make reductions, and in others, where little progress was being made, have made reductions in order to try and force the pace. With coal costing in many cases up to £2 per ton, high prices for gas are not surprising; and 12s. 6d. to 15s. per 1000 cubic feet in small district towns is not uncommon. My experience may be interesting to you. In No. 1 town, which was very backward, a reduction was lately made from 12s. 6d. to 7s. 6d. per 1000 cubic feet; and the private consumption for the last two months rose to 216,000 cubic feet, compared with 173,000 feet for the same period last year—an increase of nearly 25 per cent. Coal at this price cost 21s. per ton delivered into the works. This instance of a drastic reduction is really an experiment, and is so far satisfactory. In No. 2 town, reductions were made from 12s. 6d. per 1000 cubic feet to 10s., with an alteration of discounts; and the private consumption for the last two months rose to 394,000 cubic feet, compared with 381,500 feet for the same two months of 1906—an increase of only 4 per cent. The result is also likely to prove satisfactory; but enough time has apparently not elapsed to allow the reduction to be felt, and, further, this is the smallest reduction made. Coal here cost 24s. 11d. per ton delivered into works. In No. 3 town, which was going ahead steadily, a reduction was made from 14s. 2d. per 1000 cubic feet to 10s., the discount being somewhat altered; and the private consumption for the last two months rose to 598,900 feet, compared with 462,700 feet for the same period last year—an increase of nearly 30 per cent., which is highly satisfactory, and has justified the reduction by any loss having been already met. The price of coal here is 27s. 9d. per ton. In each case most of the plant is equal to at least double, and in some cases treble, the present make.

Other instances have been similarly satisfactory; and if we could only be sure of coal remaining at its present price, and materials necessary to our manufacture keeping within reasonable bounds, still greater reductions could be made. At one town in Queensland where coal of a poor class yields about 9000 cubic feet per ton, costing 9s. delivered into the works, and the price of gas is 9s. net, we reduced the gas for cooking to 5s. per 1000 cubic feet, with promising results. In every case, gas for motive power and cooking is supplied at from 25 to 40 per cent. less than lighting gas. In each instance, of course, we had an extra outlay for coal and expenses; but the increases in what were in some cases a slowly increasing consumption will soon overtake the loss sustained. I feel sure that a progressive policy of this character is the best to pursue; but the ordinary consumer is apt to forget that, as a matter of fact, he is, through the Welsbach burner, getting the greatest reduction of all—in most cases no less an economy than 50 per cent. in cash payment, and at the same time receiving four to five times the light. As against this policy, we have to remember that, as prices of material increase, our capital cost for new business where any additions have to be undertaken will increase also. To erect a new works at the present time, compared with 15 years ago (before which I think all the works in the State were erected), the cost would be about 30 per cent. more.

It is interesting to note that in England works carbonizing not exceeding 250 tons per annum have on an average 39s. of capital employed per 1000 cubic feet of gas sold; while similar works in Victoria average about £3 10s. For gas-works carbonizing not exceeding 500 tons of coal per annum, the comparison is as 37s. 2½d. in England to 45s. in Victoria. For works carbonizing not exceeding 1000 tons per annum, the comparison is 31s. 3d. in England to 44s. in Victoria. When we consider that most of the plant for the older works had to be imported, heavy sea and rail freights into the interior, and varying customs duties paid, the difference is easily explainable; and, on the whole, the contrast proves that there has not been any extravagant outlay or unwarranted charges. The handicap of the smallest works is, however, severe, as a 1½ to 2 million a year works finds it necessary to employ in Victoria about 60 per cent. more capital per 1000 cubic feet of gas sold than a 10-million a year works. Under these circumstances, with higher charges per 1000 cubic feet and probably more expensive coal, it requires a good deal of skill to pay a dividend and supply gas at a reasonable price. In fact, a town which cannot consume 2 million cubic feet a year had better be left to the tender mercies of kerosene. There is not much in it either for gas or electricity.

In the nine works controlled by the Colonial Gas Association, using over 200 tons of Newcastle coal per annum, we were able to sell during the six months ending the 30th of June last an average of 9322 cubic feet per ton of coal carbonized; the results varying from 8960 to 10,132 cubic feet. At only three works are there complete generator furnaces in use; but in all the works we have a semi-generator working. As repairs are being carried out, the generator system will be applied in most of the works. The individual results may be interesting, showing the varying conditions and difficulties—

No. 1	Works,	8,960	cubic feet	sold	per	ton	of	Newcastle coal.
,, 2	,,	10,030	,,	,,	,,	,,	,,	
,, 3	,,	9,066	,,	,,	,,	,,	,,	
,, 4	,,	9,026	,,	,,	,,	,,	,,	
,, 5	,,	9,096	,,	,,	,,	,,	,,	
,, 6	,,	10,130	,,	,,	,,	,,	,,	
,, 7	,,	9,172	,,	,,	,,	,,	,,	
,, 8	,,	9,516	,,	,,	,,	,,	,,	
,, 9	,,	8,900	,,	,,	,,	,,	,,	

At two of our small works, using about 160 tons of coal per annum, at each of which repairs were being carried out during the half year considerably affecting the make, the results were: 8188 cubic feet and 8544 cubic feet respectively. Our average leakage is 8½ per cent. At three other small works, outside the Association, in which I am interested, the results were—

No. 1,	using only	110	tons of	Newcastle	coal	per	annum,	8552 cubic feet per ton
,, 2,	,,	500	,,	,,	,,	,,	9600	,, ,,
,, 3,	,,	500	,,	,,	,,	,,	9554	,, ,,

Most of you will acknowledge the difficulty in obtaining really good results in works of about 1½ million cubic feet a year, especially in the summer, when the make is low. Some of the works have coal direct from Newcastle, others by steamer, rail, and cart, entailing loss in transit in many cases to a heavy extent, which considerably affects good results where no allowance is made for loss in transit. If it is possible, every manager should have a generator furnace. They are invaluable in small works. Above a certain make, they will save you coke, which is a considerable factor in the balance-sheet; but even in a one-man works they save the manager much time in firing, and enable him to attend to his outside duties more freely. Small works generally have been slow to introduce the generator system; but there is no doubt the extra initial expense is soon saved in the larger coke returns, and particularly in smoother working. The question will be brought up for discussion at this meeting, when I trust valuable experience will be forthcoming. I was rather interested to note that in America it sometimes pays better to use coal in the retort-fires, so as to release the coke for sale. American gas managers state that in thus working they have less trouble with the settings. Of course, this can only be practicable where coal is cheap—namely, about 6s. or 7s. per ton—and where coke is bringing from 12s. to 15s. per ton.

I leave the general routine of gas manufacture to your imagination, which can easily conjure up various works and methods employed, on all of which much might be said. In purification, for instance, we find the cost varying from 3d. to ¼d. per 1000 cubic feet, with lime or oxide—each efficient in its own way if properly applied. The worries of the unaccounted-for gas I am glad to see are being referred to in the Question Box, and will give rise to an interesting discussion. The conditions of reticulation in Australia are very different from those in older countries. No one yet has undertaken a thorough analysis of our gas undertakings in Victoria, and I am hoping this Association will soon take the matter in hand. When it is done, it will be found that the consumption per mile of main will be probably about 30 to 50

per cent. less than in England—that is, we have a considerably larger mileage of mains for our consumption, and, consequently, a greater percentage of leakage per ton of coal used; but it is not necessarily greater per mile of main laid. If each manager will co-operate in supplying the statistics required, I shall be very pleased to classify and work them out for the information of the Association. They would form one of the most interesting studies that could occupy our attention.

The value of automatic lighting and extinguishing will be referred to at this meeting; and I will only mention here generally the subject of street lighting. There is no place in the world more difficult to satisfactorily carry out the lighting of public streets than Australia. There is no part so dusty. In up-country towns especially the lamps are difficult to keep clean. Wind and dust are everywhere. There are few days on which dust does not blow about; and, consequently, the glass of the lamps becomes opaque, the burners get stopped up, and complaints occur. Now, I look upon the street lamps as a most desirable advertisement; and continual watchfulness is essential. The councils have to be satisfied; and no pains must be spared to make the public lamps a credit to the town. It is astonishing how much a gas company is judged by the street lamps. If they are badly maintained, the people at once say, "What wretched gas these people supply," whereas probably it is a first-rate gas; but the fault is that the burners want cleaning out of all flies, moths, and dust that have been attracted by the once brilliant light, or blown up by the wind. A well-maintained Welsbach 60-candle power burner, with an occasional cluster or Kern or other high-power burner, leaves little to be desired in street lighting. In Edinburgh, the Corporation have adopted the "Star" inverted burner for their streets. It is also satisfactory to note that corporations which own both electricity and gas undertakings use gas for street lighting in preference to electricity, both for efficiency and economy. In Liverpool where the Corporation own the electricity works, and light under four miles of streets with their own current, gas is bought from a local Company to light 411 miles of streets. The increase of street lighting by gas in fact all over the world is eminently satisfactory. Even such a noted electrical engineer as Sir William Preece recently advised incandescent gas to be used to light the Carnarvon Promenade, as causing a better distribution of light for public thoroughfares. Mr. William Swinburne has collected much valuable information on this matter.

To give gas fair play, however, we must have the co-operation of the municipal councils. There are very few councils in small towns that take a real pride in the street lighting. Old-fashioned lanterns, often wooden posts for pillars, are all that are available; and I would advise, where this pertains, that the gas company should offer to provide pillars, if necessary, and lanterns of modern pattern fitted up with the best class of burner, and spread the cost in the price of lighting over a number of years, including all maintenance. It is a delight to find some councils take a real interest in the lighting of their streets. In all cases the company must offer every facility, and cut the price down to the bone. The benefit of a good street display is worth a great deal to us all, and more money must be spent on it by all companies in the future. During the last three years, we have fitted a large number of spacious square-topped and hexagonal copper lanterns, well fitted for incandescent gas lighting; and with a 60-candle power Welsbach burner the effect is much appreciated. The lanterns cost from 30s. to 40s. each. In making new contracts, we invariably try to persuade the councils to instal them, and spread the cost over the term of the contract.

The adoption of automatic gas lighters and extinguishers is a great assistance to the working of small undertakings where the extinguishing of lamps at midnight or 1 a.m. is the rule. After having had the Gunning patent at work for two years in three towns operating all the lamps—26, 25, and 40 respectively—and in partial operation at other places, we have decided to considerably extend its use. With the increased prices for horses and horse-feed, a saving can be effected; but, most of all, it does away with the necessity of a man having to go out in all weathers to "turn out" in the middle of the night, which has been the most unpleasant duty on a small works. In addition, it is possible to turn out lamps at the latest times, instead of having to average the time when it takes one or two hours to turn out by horse. I trust the discussion on the subject will bring out experiences in the various patents being tried, both clockwork and pressure. I may add that the Gunning apparatus costs £2 fixed.

In train lighting, gas has been adopted in our State with great success; the inverted mantle giving a most brilliant and regular light. The life of the mantle is about three months, although in two cars fitted with twelve mantles on the Port Melbourne line, after having run for six months, only two mantles were renewed. The cost of renewals is 6½d. each. Compared with the old flat-flame burner, which consumed 1·8 cubic feet of gas per hour and gave 16-candle power, the new mantle burns 1·3 cubic feet and gives 80 candles; the mantle affording five times the amount of light for two-thirds of the cost—a creditable result to the railway officials. In all countries gas lighting in trains is being increasingly adopted.

It is interesting to generally compare the progress of the gas industry with electric light in our State—

Gas-Works.

1900—47 works, 153,455 tons of coal carbonized, 1,516,531,100 ft. of gas made.
1906—48 ,, 178,251 ,, ,, 1,810,405,800 ,, ,,

This shows an increase of 293,874,700 cubic feet, or nearly 20 per cent. in six years. From these figures, it is noticeable that much better results per ton of coal are now being obtained.

Electric Light Works.

1900—7 works, electricity supplied 6,100,519 units
1906—9 ,, ,, ,, 9,760,046 ,,

This shows an increase of 3,659,526 units, or 60 per cent.

In six years, an increase of 20 per cent. is shown in gas consumption and 60 per cent. in consumption of electricity; but the bare percentage of increase does not divulge the most interesting point. If we convert the two increases into candle power—taking 15 candle power per cubic foot of gas and 300 candle power per unit for electricity, which is liberal—we have an increase of 4408 million candle-power-hours in gas and 1098 million candle-power-hours for electricity, which shows the great strides made by gas even now as compared with electricity.

In New Zealand the comparison is:—

1901—30 gas-works, gas made 786 million cubic feet
1906—31 ,, ,, 1275 ,, ,, ,,

I have not been able to obtain the statistics regarding electricity. In England, Europe, and America the increase in gas production is most marked, and although the electric light does undoubtedly possess many attractions, it does not make the same progress, nor can it be produced and used on the whole with so great an economy as gas.

By-the-bye, the gas-meter is frequently alluded to as a "first-class liar;" but the following figures of the London County Council show that the electric meter can give it a long start. In 1905, the officers of the Council tested 2396 electric meters, of which only 1226, or 51 per cent., were passed as accurate at the first test, though direct from the makers; 410, or 17 per cent., were passed as accurate after adjustment and further testing; and 760, or 32 per cent., were rejected as inaccurate.

In comparing the two rival illuminants, I do so in the most friendly spirit, and principally from a purely commercial aspect. Electricity, with its marvellous potentialities, is one of the greatest boons yet discovered for the use of man. In many instances it will outrival gas, even in its adaptability for lighting; but in all-round usefulness and efficiency gas can still hold its own. In no case, however, can we afford to sit down contented with our work or what we have achieved. Though the incandescent electric lamp has made little progress in efficiency during the last 25 years, there is every sign that lamps will be produced which may be stronger and cheaper and have a longer life, and thus give an impetus to electric lighting. It is therefore necessary for gas engineers to be keen in adopting the latest appliances, to be as liberal as possible in their treatment of consumers, and not be afraid of scrapping where new appliances will save money.

The future holds out every encouragement to us. Our prospects in the widening of the uses to which gas can be applied were never so promising. With a growing necessity for less smoke and dirt in our towns, the uses of gas for trade and household purposes are practically without bounds. Our success will, however, be limited by our ability to provide gas at a cheap rate and satisfy the public. This means ceaseless activity; and, in the continued increase in price of materials, the exercise of much skill.

Before concluding, I wish to congratulate our energetic and able Honorary Secretary, Mr. P. C. Holmes Hunt, on his promotion to the post of Engineer of the Metropolitan Gas Company. We are all pleased, I am sure, to hear of his success, and wish him a long and useful career in that most honourable position. Mr. Hunt, as Hon. Secretary, has given a great deal of time and thought to the welfare of the Association; and we owe him a debt of gratitude for the efforts he has made on our behalf. He will be able to show us, on our visit to West Melbourne, the most up-to-date appliances in Australia; but I will leave it to him to give you full particulars and information.

A Gas Association for the South-West of England.

Some weeks ago, at a meeting of gas managers held at Taunton, it was unanimously resolved to form an Association of Gas Managers for the South-West of England, for the purpose of bringing about a weekly exchange of information relating to the stocks and prices of coke, tar, and sulphate of ammonia, and the friendly discussion of matters of interest to the members. It is proposed to hold quarterly meetings; and it is believed that an annual subscription of 10s. 6d. per member will cover all the expenses. Much regret was expressed at the dissolution of the old South-West of England Association; and it was felt that the new one would, in a measure, fulfil some of the objects of the former organization. It was resolved to communicate with all the gas undertakings in the district, and explain the intentions of the Association; and in the circular sent out, extracts were given from the annual report of the Yorkshire Commercial Section of the Manchester District Institution of Gas Engineers. It was thought that these would afford some indication of the useful information exchanged between the members of the section; and it was suggested to conduct the South-West Association on somewhat similar lines. It is thought that there is a wide field of usefulness open to the Association, and that it will satisfy a long-felt desire for mutual intercourse. The meeting was convened by Mr. A. S. Brook, the Gas Manager of the Chard Corporation, who is Hon. Secretary of the Association, the first meeting of which will be held at Taunton on the 14th prox.

INVERTED GAS LIGHTING IN AMERICA.

Last Year's Progress.

The March number of the "Illuminating Engineer" of New York contains an article on "Progress in Inverted Gas Lighting in 1907," by Mr. T. J. Litle, jun., in the course of which he makes some interesting remarks which are reproduced below.

The author begins by acknowledging that the inverted gas-light was brought forcibly to the attention of the American public during the past year. While at first it was looked upon as a novelty in gas lighting—its principal merit apparently being that it had great decorative possibilities—its practical value from an economic standpoint was soon perceived; and it was this recognition on the part of lighting companies that led to the adoption of the system for commercial and private lighting. Mr. Litle attributes the high efficiency of the inverted gas-light to the advantageous placing of the mantle below the burner in a pendant position, with nothing below to obstruct the light, and a more complete aëration of the external surface of the mantle—thus increasing the surface combustion. As a result, it is found that the surface of the mantle may be materially reduced compared with that of the upright mantle. This constitutes a very great advantage, particularly from the standpoint of durability; for the larger the mantle the weaker it is, and the smaller the mantle the greater is its strength. It is pretty well known that the life of an upright mantle is limited directly by its ability to withstand shocks. It has been found in practice that the already large amount of useful illumination given by the inverted mantle can be greatly augmented by properly designed reflectors.

The author goes on to show that from the commercial standpoint the inverted gas-light has been a boon to the gas companies, inasmuch as it has enabled them to procure lighting business which before was unobtainable with the use of the upright incandescent burner. This, he says, is particularly true in the lighting of the better-class shops in the larger cities. The wonderfully high lighting efficiency of the inverted gas system was, however, not alone responsible; the artistic design of the burners and glassware in combination with special fittings contributing largely to their successful application. Furthermore, a campaign of education was inaugurated by the Welsbach Company in the form of printed pamphlets, whereby the fundamental principles of gas illumination were very clearly set forth, the newer developments carefully noted, and the efficiency of the various types of incandescent gas appliances on the market pointed out. During the past year, a large number of gas companies extended the campaign of education along the lines of practical illumination by organizing their sales and appliance departments and holding monthly and semi-monthly meetings. Mr. Litle attended a number of these gatherings, and from what he observed he thought they would ultimately result in greatly raising the standard of artificial illumination.

In order to substantiate his statement that the inverted gas-mantle is adapted for conditions which would not warrant the use of the upright form, the author quotes from a paper on "Car Lighting" read by Mr. R. M. Dixon, the President of the Safety Car Heating and Lighting Company, before the American Society of Mechanical Engineers early last year, to the effect that there were then in North America 33,000 railway coaches equipped with inverted mantle burners. He has also noticed inverted gas-lamps in use in freight and passenger elevators, where it would have been folly to have used upright mantles. In machine-shop practice, it is now pretty well conceded that the inverted mantle furnishes an ideal illumination. From the fact that a large volume of light may be thrown directly upon the work, and that with the various types of reflectors the operator can perfectly shield his eyes, the illumination thus obtained has in every case been so greatly appreciated by the user that Mr. Litle considers the 16 and 20 candle power electric units have been relegated to the past. He knows there are some who will dispute this statement; but, from actual observation, he has noted the favourable reception given to the inverted gas-burner where it has been placed on trial over machines and work benches, and the highest authorities say eye-strain is due as much to insufficient illumination on the work as to the presence of unshielded lamps.

The author points out that in adapting inverted gas-lights to workshop practice, it has been found that the best results have been obtained when the lamps were suspended from flexible metallic tubing attached to overhead swing brackets, which enables the lamp to be moved through a large horizontal arc in order that the light may be placed at one side or the other of the work. It might be assumed, he remarks, that the gas lighting of modern factories would not be feasible from the fact that a great many shops generate their own electric power. While this may be quite true in some places, there are numerous instances where gas lighting not only gives superior illumination, but also proves more economical. The chances for the introduction of gas lighting into factories are, therefore, infinitely greater than ever; for it has been pretty clearly set forth that, for a given expenditure, a great deal more illumination can be obtained with gas than with electricity in any form.

After a few remarks on shop-window lighting—a subject which has been dealt with frequently in the "Illuminating Engineer"—Mr. Litle points out that, after all, the lighting of the home is the problem which continually demands the undivided attention of engineers; and the reception given to the inverted gas-burner in this department of lighting has been truly phenomenal. The distribution of light is considered to be almost ideal; and decorative glassware can be employed without interfering with it. The adoption of systems of automatic gas lighting and extinction has greatly facilitated the use of inverted gas-burners for interiors. The progress made last year fully justifies the conclusion, in the author's opinion, that far greater advances will be witnessed in the current twelve months.

AUTOMATIC LIGHTING AND EXTINGUISHING.

A patent has been taken out in France by M. Pierre Trambouze for appliances for automatically lighting and extinguishing gas-jets. The specification has been published in "Le Gaz," from which the following particulars are obtained.

The arrangement consists of an air-compressor, an india-rubber bag or a small force-pump, and an obturator set in motion by the air coming from the compressor. The action upon this part of the apparatus, which is placed near to, or at a distance from, the gas-burner, and connected with it by a small pipe, is transmitted to the mechanism which opens the gas-passage, while a certain quantity of air remains stored either in the compressor or in a small independent reservoir, the object of which is to maintain the mechanism in its working position for a certain time determined upon. A jet of the stored compressed air is directed on to part of the apparatus in such a way that the mechanism works back and closes the gas-inlet under the influence of the lowering of the pressure of compressed air at the expiration of the time fixed. The illustration shows two forms of the appliance.

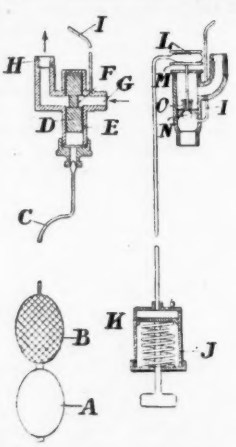


Fig. 1. Fig. 2.

In fig. 1, A and B are india-rubber bags—one for compressing the air and the other for storing it—furnished with the necessary valves. C is the pipe conveying the compressed air, and D is a piston moving easily in the cylinder E; both of the latter being so adjusted as to obstruct the passage of gas and compressed air. When the bag A is pressed, the compressed air actuates the piston, which is driven up to the top of the cylinder—the position shown in the illustration. As the hollow part of the apparatus F forms a channel, the gas arriving by the supply-pipe G is enabled to feed the burner (screwed on at H), which is lighted by the flash-jet I, kept constantly burning. The piston remains at the top of the cylinder as long as the pressure of the air in the bag B is sufficient to keep it in this position; when it is not, the piston falls by its own weight, and closes the gas-inlet—the flash-light, however, remaining unaffected. It will be seen that the duration of the lighting depends upon the quantity of compressed air and its more or less rapid rate of flow.

Fig. 2 shows an appliance constructed on the same principle, but differently arranged; the india-rubber bags being replaced by a force-pump J, which also serves, by means of the spring fixed below the piston K, as a compression chamber. The compressed air inflates a bladder L, depressing the plate M, which acts upon the plug N, and opens the gas-inlet. When the piston of the pump is at the end of its course, the spring O causes the plug to rise again (the bladder no longer exercising pressure), and close the gas-passage. This arrangement, like the other, is provided with a flash-light I.

As the result of a large increase in the business of Maughan's Patent Geyser Company, Limited, and the wider field opened by the introduction of new appliances for general hot-water supply, the Company have effected an amalgamation with the Parkinson Stove Company, Limited, of Spring Hill, Birmingham, who will henceforth carry on the concern as their "Geyser and Water-Heater Section." The business has been acquired as from the 1st of January last; and Mr. T. E. Barralet, who has been associated with the Maughan Company since its formation in 1884, will continue as Manager.

A VISIT TO THE DERBY GAS-WORKS

By the Midland Junior Gas Association.

In acceptance of an invitation that was extended to them some time ago by Mr. J. Ferguson Bell, the Engineer and Manager, members of the Midland Junior Gas Engineering Association to the number of over fifty, last Saturday afternoon paid a visit, which had been anticipated with much pleasure, to the two works—the Litchurch and the Cavendish Street—of the Derby Gas Company. Mr. W. E. Caton, the President of the Association, is Mr. Bell's Chief Assistant; and it may be remembered that it was when Mr. Bell attended the meeting in Birmingham last October, when Mr. Caton delivered his Inaugural Address, that he invited the members to pay a visit to the Derby Gas-Works.

One of the things that excited most interest was naturally the De Brouwer machinery, which was described by Mr. Bell in the paper he read before the Institution of Gas Engineers in 1904 (see "JOURNAL," Vol. LXXXVI., p. 766), and was also dealt with in his address by Mr. Caton (see Vol. C., p. 178), who on the same occasion gave some particulars with regard to Mr. Bell's method of overcoming the naphthalene difficulty. On arrival at Derby, the visitors proceeded at once to the Litchurch works, where they were met by Mr. Bell, under whose guidance—and that of Messrs. Caton, Fisher, Twigg, Foster, Marsden, and Waller—they were shown round in parties. The Association were fortunate in being able to see a good deal of work under construction. As, of course, is well known, the Derby Gas Company have recently been considerably extending their operations. During the past ten months, there has been an increase of over 40 per cent. in the consumption; and of this 30 per cent. was due to taking over the supply of gas to the Midland Railway Company's works, and some of the balance to the absorption of two small Gas Companies—the Etwall and the Spondon. Even after allowing for these extraordinary increases, however, the Company's own increase inside the town of Derby and over the old district for the past twelve months has reached the highly satisfactory figure of something like 7 per cent. Hence the need for the reconstruction work decided upon by the Board on Mr. Bell's recommendation, which will practically double the capacity of both the Litchurch and the Cavendish Street works.

THE LITCHURCH WORKS.

One of the first things that strike a visitor on entering the Litchurch works is that there is plenty of ground space. As a matter of fact, the works at present occupy an area of about 8¾ acres; and they are favourably situated, as they adjoin both the Midland Railway and the Derby Canal. When the present site is filled up, too, there is available on the other side of the canal about 12½ acres. The works are divided into two sections, so that either one or both can be used, as required. At the present time the make at these works is 1,600,000 cubic feet per day; but when the extensive reconstruction work which is now in hand is completed, the capacity of each section will be about 2,250,000 feet—making the maximum output of the works 4,500,000 cubic feet. The works were laid out originally by the late Mr. Thomas Hawksley, a little over 25 years ago. They were then equal to something like 1,500,000 cubic feet output—that is about 750,000 feet for each of the two retort-houses. This was, of course, with the old direct fires. Now by reconstruction one retort-house has been fitted for an output of 2,250,000 feet; and the work on the other is in hand. This has been accomplished by doing away with the direct-fired beds, and putting in larger retorts and regenerative furnaces, and getting a bigger make per mouthpiece. With the direct-fired system, the make per mouthpiece was 4500 cubic feet; whereas they are now getting 7500 cubic feet.

In No. 1 retort-house, there are eighteen beds of 22 in. by 16 in. through retorts, 18 feet long. The charging and discharging is performed by separate De Brouwer machines; the charger being fed with coal from continuous overhead hoppers, which contain 24 hours' supply. This capacity of the hoppers is an advantage, as it allows of the whole of the coal breaking and elevating being done by a day shift. The coal is brought in by the Company's own 12-ton waggons, fitted with end doors. These are emptied over the breaker by means of a tipper worked from one of the gas-engines; and the coal is then elevated into the hoppers—the capacity of these appliances being 40 tons per hour. The cost of handling coal at the works is less than ½d. per ton into the retort-house. The coal-handling plant was installed by the Chain Belt Engineering Company, of Derby. The coke, on being pushed out of the retorts, falls on to a horizontal De Brouwer hot-coke conveyor, and is quenched. This conveyor feeds into a cross conveyor and elevator at the centre of the house, by which the coke is elevated on to screens, through which it passes into overhead hoppers for loading into trucks or carts. Thus the coal goes in at one side of the house, and the coke comes out at the other, without ever being touched by hand. The average cost for carbonizing now is about 9½d. per ton, from the entrance of the coal into the works to the loading of the coke into the overhead hoppers. This figure, however, does not include anything for foreman's wages or boiler and exhauster men. The coke conveyor has been in operation for about five years, and is working quite smoothly. The Derby Gas Company were the first in this country to introduce De Brouwer stoking plant; and Mr. Bell's opinion of it one can safely assume is quite as high now as ever it was. The Company dispose of a lot of their coke in Derby; and their sales in this way are increasing every year, as they prepare it specially for domestic and other purposes. Plant for breaking, screening, and sizing the coke at Cavendish Street has been found so satisfactory that duplicate plant on a larger scale is being put down at the Litchurch works. From the coke heap there will be a portable railway, so that youths can tip the coke into the Tanner breaker, from which there will be an elevator that will take the coke to screens through which it will pass to the overhead hoppers for loading. The power for the coal and coke handling plant and the De Brouwer charging and discharging machines is derived from duplicate 70 B.H.P. "National" high-speed gas-engines. There are two small dynamos belt-driven for the De Brouwer machinery; but everything else is direct-driven from the gas-engines. All the machinery with the exception of the coal-handling plant was supplied by Messrs. W. J. Jenkins and Co., of Retford.

The seals on the dip-pipes in this house are regulated by Dillamore tar-columns; and each bench is provided with a retort-house governor. In fact, these governors are installed at both stations; and Mr. Bell's opinion of them is that they are one of the best things ever introduced into a gas-works. Since their installation, he has not found any increase in the make; but there has been a more constant candle power. The works superintendent can set the governor to what he likes, and no one can then interfere with it; and by its means they govern just where they want to govern—at the retorts. At the present time in this house six-hour charges are being worked, of about 6½ cwt. The coal employed is about 80 per cent. Derbyshire and 20 per cent. Yorkshire. Most of it is small coal—nuts and through-and-through—large screened coal not being used. When the retorts are discharged, instead of using an iron stopper, just a little of the worked-off charge is pushed back into the retort, clear of the mouthpiece. The coke that was being taken from the retorts at the time of the visit was the subject of some complimentary remarks on the part of the members.

A number of settings of different makes have been tried; but those which Mr. Bell finds suit him best are the Klönne, and a contract has just been placed with Messrs. T. Vale and Sons, of Stourport, for eleven sets for No. 2 retort-house. This house, which is now under reconstruction for the purpose of replacing the existing direct-fired retorts by regenerative furnaces, and so increasing the output (as has been done in the other case), will be a stage house instead of a cellar house like No. 1. Mr. Bell is raising it 18 feet, which will make it about 45 feet from the ground level; and the charging floor will be at a height of 10 ft. 6 in. The eleven settings of eights now in hand will replace half the twenty-two beds of sevens direct-fired. The existing retorts are 18 feet through; and the width of the house will not permit the new ones being any longer. The idea is to have two gas-engines, one on each side of the house, to work the coal and coke plants. Last winter Mr. Bell had very nearly all his retorts going; and next winter he will be making gas in one section of No. 2 house. In this house he says he is going to try anti-dips.

At the end of each retort-house is a set of condensers, each consisting of three scrubber condensers and three vertical rows of 12-inch pipes. The scrubbing and washing plant for section No. 1 consists of (in series) a 2,000,000 cubic feet Livesey tar-extractor, a tower scrubber 12 feet diameter by 60 feet high, and a Kirkham, Hulett, and Chandler "Standard" rotary washer. When completed No. 2 section will be similar to this. The exhauster-house contains for each section a Donkin and a Gwynne direct-driven exhauster—four in all—each of 60,000 cubic feet per hour capacity. Two new sets of exhausters of a capacity of 120,000 cubic feet per hour are to be put in during the coming summer.

For purification, both lime and oxide are now used. There are two tiers of oxide; and the practice is adopted of leaving the last tier in. Thus a very considerable reduction is effected in the cost of purification, because there is only half the oxide to handle. Mr. Bell is a great believer in keeping sulphur down well below 40 grains; and with the use of oxide alone, he finds this limit is exceeded. Until recently, of course, the Company were under sulphur restrictions; and they had to keep within 20 grains. The average over a series of years with lime purification was about 17 grains. The quantity of lime has now been reduced by more than one-half. For No. 1 section, there are overhead purifiers, so arranged that the lime can be discharged from the bottom into carts. The size of the boxes is 30 ft. by 25 ft. by 6 ft.; and each box is fitted with four luteless lids, with Milbourne's patent fastenings and valves. There are at present in course of construction elevators and band conveyors for filling the boxes with lime and oxide. For No. 2 section there are four ground-floor purifiers, 30 ft. by 15 ft. by 4 ft., with water-lutes. The boxes are worked in series—three on and one off—by Cockey's centre-valve. There are tar and liquor wells under the lime-store, which is situated between the two purifying-houses. On the works there are three holders. No. 3, which is the largest in diameter, and is at present a two-lift one, is being converted into a four-lift. Its capacity is now 750,000 cubic feet; and when it is enlarged, it will be about 1,500,000 feet. The guide-framing is being raised for the third lift; and the fourth lift will rise clear of the framing. Messrs. C. & W. Walker have this work in hand. No. 2 had a couple of lifts added a few years ago, when the guide-framing was carried up for one lift; the top lift being cable-guided on Messrs. Ashmore

Benson, Pease, and Co.'s system. Its capacity is now 1,000,000 feet. No. 1 is a small one, holding about 340,000 feet. All three holders were originally constructed to Mr. Hawksley's designs; and the substantial character of the guide-framing enables the additions for the extra lifts to be made without difficulty.

There are three Lancashire boilers, 28 feet by 7 ft. 6 in.; and in addition to Dixon's superheaters and a Green's economizer, they are fitted with forced draught arrangements in the shape of a Sirocco fan and Davidson's patent breeze furnaces. By this means Mr. Bell gets rid of all his fine breeze, which formerly had to be either given away or sold at perhaps 6d. a load. The forced draught is quite noiseless; and the present method is found to be a very economical way of raising steam. The water supply for the works, it may be remarked here, is pumped from the canal. There are two Parkinson station meters, each of a capacity of 60,000 cubic feet per hour; and the gas is delivered to the town through governors on 24-inch and 30-inch leading mains. On the outlet main from the meters is fixed a Livesey washer (with "Derby" solvent) for Mr. Bell's naphthalene process, by means of which the naphthalene in the gas as supplied to the town is kept down to 2½ grains per 1000 cubic feet. Mr. Bell has lately been trying the effect of taking the gas from the foul main up above the retort-bench and passing it right into the condensers; and he has found that the gas then contained, as supplied to the town, about 7 to 8 grains of naphthalene. Then he altered these conditions, and tried the result of passing the gas through a foul main right along the inside of the retort-house; and this, by keeping the gas warm and in contact with tarry matters, reduced the naphthalene to about 2½ grains. There has been installed on the works, by Messrs. John Swallow and Co., of St. Helens, a complete Davis-Neill plant for the manufacture of yellow prussiate of soda; and the working of this was explained to many interested members by Mr. G. K. Davis. The cyanogen is extracted from the gas by means of a Holmes rotary brush washer, after the gas has passed through a Pelouze and Audouin tar-extractor. The sulphate of ammonia plant, for producing 3 tons of sulphate per diem, consists of Colson's patent stills, Wright's heater, and Walker's overhead discharge saturator. In the meter-house there is a Maxim-Clark benzol carburettor.

Tea at the Gas Offices.

When the Litchurch works had been thoroughly inspected, the members found close by a special car awaiting them; and in this they were conveyed to the handsome offices of the Company at Friar Gate, in the centre of the town, where (in the spacious room in which it has been customary to hold the annual meetings of shareholders) they sat down to tea at the invitation of Mr. Bell, who occupied the chair, and was supported by Mr. H. Bullivant, the Secretary of the Company, and Mr. Caton. At the conclusion of the meal,

Mr. A. O. Jones, of West Bromwich, said it was his pleasant duty to propose a hearty vote of thanks to Mr. Bell, Mr. Bullivant, and the assistants, for having done everything they could to make the visit a pleasant and instructive one, and also to Mr. Bell for his hospitality. Before the inspection, Mr. Bell had told them to ask as many questions as they liked, and to learn everything they could about the works. This was just the spirit in which a visit of this sort should be carried out, so as to render it as advantageous as possible to the members.

Mr. J. Darrah, of Birmingham, in seconding, remarked that the visit that day would rank with the best of the many that had been arranged for the Association. They had had an opportunity of seeing some of the most modern machines which had been introduced for the purpose of reducing the net cost of gas production; and the satisfactory manner in which they were working reflected the greatest credit on those responsible for their installation. He himself had been very keen on seeing the electrically-driven machinery, and many of the other up-to-date appliances which Mr. Bell had adopted; and he had had a most instructive afternoon. He felt sure he could say the same for all the members.

The vote having been carried by acclamation,

Mr. Bell, in acknowledging it, said he would like first of all, on behalf of the Directors, himself, Mr. Bullivant, and the others connected with the Company, to offer those present a hearty welcome to Derby. They had been pleased that the Association should visit their works—and more especially during the time when his Chief Assistant, Mr. Caton, was the President. From what he knew of Mr. Caton, he was convinced that his duties as President had been discharged in a manner satisfactory to the whole of the members, and that the prestige of the Association would be quite safe so long as it was in the hands of such men as Mr. Caton and those who had preceded him. He thought it was a happy idea on the part of those who were responsible for these Junior Associations that from time to time the members should visit works in different towns, and see what was actually being done. There was no doubt whatever that by the visiting of works much could be learnt—not only with regard to what should be adopted, but also possibly sometimes with respect to what should be avoided. He was glad to hear from the proposer and seconder of the vote of thanks that the visit to Derby had been a pleasant one; and he only hoped that the members would be able to take something away to think over, and perhaps to modify and improve, so as to adapt it to the particular circumstances in which they might be placed. In going round the Derby works, they would notice that the buildings were all plain and substantial. He was totally opposed to ornamentation in gas-works. He believed in the buildings being well and substantially designed, and of a plain and simple character; and he was firmly convinced that structures of this character would look better in years to come than those of a more ornate style. The Litchurch works they had already inspected; but they had yet to see the Cavendish Street works, in which they would be more particularly interested, because Mr. Caton had very largely assisted him in carrying out the alterations at these works. It would afford him great pleasure at some future time to see the Association again at Derby; and then perhaps they would be able to show them the reconstructed works in a complete state. He might say that in carrying out the alterations and extensions, the two words they had kept before them had been "Efficiency" and "Economy," so that when the works were wholly completed they would be able to manufacture gas cheaply, and their capital expenditure would be lower than at the present time. He was firmly convinced that those works that had a large capital expenditure would be most disadvantageously placed in future competition with electricity and other illuminants. It was very easy to spend money—they could all do that; but to spend money so that it would bring in a fair rate of interest required a good deal of discrimination and sound judgment. He took it that the visits of the Association to Derby and other towns were undertaken in order that the members might be able to exercise such discrimination and sound judgment, and, when the opportunity occurred, adopt the best and the most modern plant. He would like to say a word or two with reference to the help he received from his assistants. He would not name them personally, because that would be invidious; but he could say that they were all loyal and energetic in the performance of their duties, which they discharged to the best of their ability. In Derby, they had one end in view—that was, to give satisfaction to their numerous consumers, and do the best they could for them. The different departments of the Company worked together heartily; and the presence of the Secretary by his side would indicate that the relations between the engineering and the secretarial branches were of the most cordial description. This, he thought, should be the case in all works. The object should be to push the undertaking forward, and when they secured consumers to see they gave them satisfaction and so kept them.

Mr. Bullivant said he had been very pleased that afternoon to have had an opportunity of meeting the members of the Association. It was the first time he had ever been in the company of any engineers at a gathering of this sort. He hoped that what they saw at Derby would be of assistance to them. Such little outings as this, to view works, must encourage them to ventilate any ideas they might have at different times. Mr. Bell had referred to the cordial relations existing between the engineering and secretarial departments at Derby. Both branches worked as one. They had a single object in view—namely, to work in the interests of the stockholders and develop the business as much as they could. During the eight years or so that Mr. Bell had been at Derby they had worked most harmoniously together. If the members desired any information as to the secretarial department, they had only to ask him, and he would be pleased to give it.

Mr. Caton, on behalf of himself and Mr. Bell's other assistants, also briefly acknowledged the vote.

The Cavendish Street Works.

The members then proceeded to carry out the last item of the full afternoon's programme, by inspecting the Cavendish Street works, which are situated at the back of the offices, and therefore practically in the middle of the town. This was the site of the original works, which were erected in 1820; but though such a central position must be an undoubted advantage in many respects, there is no railway siding into the works, and at present the coal has to be carted about half-a-mile. The Great Northern Railway, however, runs near the works; and the Gas Company are arranging, under a clause in their new Act, to put an overhead conveyor across a street which separates the works from the railway. The liquor is conveyed from the Cavendish Street works to the Litchurch gas-works in tank-waggons. The make of gas at these works is now about 750,000 cubic feet per day; and when the reconstruction is finished, the maximum output will be 1,500,000 cubic feet, thus, with the Litchurch works, rendering available an output of some 6,000,000 cubic feet per day—a provision which is not more than is necessary, in view of the fact that last winter the maximum amount of gas sent out reached about 4,500,000 feet.

There are two retort-houses. One contains six beds of eight through retorts, 18 feet long, heated with Drake's tube regenerators; and in this house are to be seen the first De Brouwer charging and discharging machines erected in this country. The charging machine is fed with coal from continuous overhead storage hoppers, and is suspended from rails. The discharging machine on the opposite side of the bench was the first of its kind. The other house also contains six beds of eight through retorts, 18 feet long, with Klönne regenerators, put in by Messrs. Sugden and Co., with Hudson's producer. Here, as at the Litchurch works, the coal storage hoppers are of 24 hours' capacity; and they are filled by a longitudinal scraper conveyor, which is fed by an inclined conveyor from the other house. The retorts are charged and discharged by a Jenkins-De Brouwer combined stoker, electrically driven. The power for this, as well as for the conveyors, is generated by a dynamo driven by means of a

33 H.P. "National" gas-engine. The coke is removed in barrows. The cost of carbonizing is 7½d. per ton, including unloading the coal and taking the coke out—which is done by hand. This figure, however, does not include wages of foreman and exhauster men. In this works also the excellently carbonized charges were remarked upon. The cellar (like that which the members recently saw at Stafford) is covered with white glazed brick, which gives it a very bright appearance. Mr. Bell says this does not cost any more than blue brick; and he is in a position to know, as, of course, he was responsible for putting the glazed bricks in at Stafford, as well as at Derby. Another advantage is that they are easily kept clean. The bricks need not be the best obtainable—in fact, those Mr. Bell uses are what are called "thirds." The average make here for the past week, Mr. Bell informed his visitors, was 12,000 cubic feet per ton of about 16½-candle gas, tested by a "Metropolitan" No. 2 burner. They find at Derby, especially for inverted burners, that 16½-candle gas is better than a higher quality. The seals on the dip-pipes in both houses are regulated by Dillamore tar-columns; and each bench is provided with a retort-house governor.

The condensers, which are of a capacity of 2,000,000 cubic feet a day, consist of eight steel columns, 3 ft. 6 in. diameter and 30 feet high. The first column is filled with boards put on edge, and is used for washing the gas with light tars—the first portion of the "Derby" naphthalene process. The next five columns are annular; the inner cylinder being 2 ft. 10 in. diameter at the top, tapering to 2 feet at the bottom. The last two columns are fitted with 2½ inch tubes, and can be used as a water-tube condenser. There are two steam-driven exhausters of 40,000 and 60,000 cubic feet per hour, for which there are two Cornish boilers fitted with "Victoria" breeze furnaces. The Livesey washer and tower scrubber are of 2,000,000 feet per day capacity; the latter having a patent tar-extractor fitted in the base, and being filled with boards placed on edge. Inside the scrubber, at the top, a revolving brushwood wheel is fixed, which distributes the water or liquor over the whole surface of the boards. The last of the seven bays of the 1,000,000 cubic feet "Standard" washer is filled with "Solvene"—the second portion of the naphthalene process. At present all the purifying at these works is done by lime; there being four boxes 20 ft. by 14 ft. by 4 ft., worked by a Cockey's dry-faced centre valve, so arranged that all four may be worked together or three on and one off. The members saw in course of erection in a new purifier-house four purifiers which had been removed from the Litchurch works, and which it is intended to fill with oxide and work by an 18-inch Weck valve. All the purifiers are of the water-lute type. The gas passes through a station meter of 40,000 feet an hour capacity; and the storage consists of three holders of a combined capacity of 500,000 cubic feet. There is on the works a Pintsch carburettor for benzol enrichment. The gas is, however, only enriched when necessary; and not much benzol is used.

There was to be seen a small stone-breaker, employed for pounding up all the refuse, which is then used for concrete or sold to builders. Mr. Bell declares that such a machine is a very good investment. The coke is broken, elevated, and screened; being sorted into four sizes. It is then bagged and sent out. At these works there is a large repairing shop for meters, fittings, &c. Mr. Bell is a great believer in good roomy workshops, and he likes when possible to have them all on the ground floor, which is much better for supervision. The members were able to inspect some samples of the "Derby" pattern cooker, of which Mr. Bell has fixed something like 12,000. They are packed and enamelled inside; for he regards it as a mistake to hire out unpacked stoves to slot-meter consumers. Mr. Bell's contention is that such consumers pay a high price for their gas, and have little money to spare; and therefore he designed this cooker, which is fitted with an extra wide door, so as to permit of a joint being easily put in and taken out. The cookers (which are made by two local firms) are giving great satisfaction; and the Company are fixing them at the rate of between 1000 and 2000 a year. Mr. Bell says his experience is that slot cookers are often kept in a better condition than those in larger houses.

In bringing this notice to a close, it must be remarked that it does not by any means exhaust the points of interest that were to be noted during the Association's inspection of the Derby Gas-Works.

The President of the Board of Trade has appointed a Committee to consider and report how far any change is desirable in the form in which the trade accounts of the United Kingdom are published as regards the countries from which imports are received and to which exports are sent. One of the members of the Committee, of which Sir Robert Giffen, K.C.B., F.R.S., is the Chairman, is Mr. Henry Birchenough, C.M.G., one of the Directors of the Imperial Continental Gas Association.

The death occurred at Thornbury, Sheffield, last Friday, of Lady Mappin, wife of Sir Frederick Mappin, head of the firm of Messrs. Thomas Turton and Sons, and Chairman of the Sheffield Gas Company. Lady Mappin, who was in her 89th year, had been ailing for several months; and Sir Frederick is also in very feeble health. She came of an old Sheffield family, and supported her husband in all his public work. She took great interest in local charitable and philanthropic institutions, of which she was a most generous supporter.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Gas-Stove Defects and their Remedies.

A well-attended meeting of the London and Southern District Junior Gas Association took place last Friday evening, at the Cripplegate Institute, E.C.—the President (Mr. W. Upton) in the chair—to hear a paper by Mr. P. J. Smithers, of the Gaslight and Coke Company, on "Gas-Stove Defects and their Remedies."

The remarks which the author had to make (and which he illustrated by examples and black-board sketches) were of an exceedingly practical character, and were, he pointed out, the result of experiences which had been chiefly gained on a district where there were at the present time 64,589 stoves in use, and where such appliances were being fixed at the rate of 5640 a year—among which large number it was only natural to expect to encounter a few defects. His suggested remedies were those derived from his own practice, and not from text-books or hearsay; but at the same time, he did not contend that his own methods were the correct ones, and that all others were wrong. The defects to which he directed attention were not of construction or manufacture, but those that were common to fires or stoves, and those which arose from faulty fixing and maintaining (which he thought were possibly the most important). From the latter source, complaints were numerous; and men undertaking this work, in his opinion, required a special training, so as to understand the various kinds of appliances. He remarked that he had known good, practical fitters with no knowledge of stove or fire fixing; and he had also come across men well up in fixing who possessed no knowledge of how to attend to defects. Makers in sending out their goods could not too fully describe any new or peculiar points in their wares, so that they could be easily understood by the fitter and examiner; for it was hardly reasonable to expect a fitter to immediately understand any apparatus the first time he saw it, or fair to the article not to show it to perfection. An indifferently fixed stove would give a bad impression to the customer; and this they should endeavour to remove at once by remedying the defect. All those connected with the distribution department should take the utmost care to see that the fitters under their charge understood both the fixing and the apparatus.

Some of the things which caused an atmospheric burner to fire-back were, Mr. Smithers said, burr or rough edges in a burner or casting; the injectors being not in straight, or not the proper distance in the air-chamber; and the air-chambers being choked with dust or carbon. Assuming, however, that the burner was perfect in construction, the only cause of firing-back—whether in the case of a hot-plate, oven, fire, or incandescent burner—was sluggish pressure or else a draught. A draught might come from under doors, from windows, down chimneys, or even from a quickly passing dress; but with the pressure was mostly where the fault lay—owing to bad regulation of the injectors, local stoppage in the supply, and sometimes to a governor at the meter checking the pressure too much. In these days of adjusting gas and air mixing chambers, the work of cleaning was rendered far simpler than under the older system of two-way injectors used in heating stoves and oven burners. The new adjusting gas and air mixing chamber was very simple and effective. The air or gas could be altered at will; and there was a great saving of labour as regarded cleaning and maintenance—there being no stove to take out. The cleaning of burners when choked with carbon could be done with a wire-brush; or a few shot or clout nails placed inside, and the burner shaken vigorously for a time, would remove all carbon. Another remedy was a few charges from a force-pump after cleaning with the brush. Nothing much would remain in the burner after this; but the operation must not be performed in a bedroom or drawing-room, or the displeasure of the lady of the house might be incurred. The cleansing by pump was not of much use for non-firing-back burners, fitted with gauze or inside slotted shields. These burners must be taken to pieces; the gauze cleaned, or the slots run through with a piece of sheet iron or tin; and the inside thoroughly cleansed with shot or clout nails. Otherwise the tips of the flame would continue to burn white. Of course, this took time; but it must be done to ensure success. No fixed rules could be laid down for the curing of noisy burners in fires. Each case had to be treated individually by the adoption of such methods as using valves in place of cocks, decreasing or increasing both air and gas way, and removing from inside the burners rough burrs causing friction. The gauzing of air-chambers he did not at all agree with, as choking-up soon resulted.

Turning to the subject of flue-pipes, Mr. Smithers said he considered these most essential on heating-stoves; and he strongly advocated the fitting, where possible, of a length of flue-pipe that reached beyond the register, so as to prevent any possibility of this closing, and the consequent throwing of the fumes into the room. For cooking stoves, however, he did not consider a flue-pipe necessary; the most effective means of ventilation being a hood, which carried away the waste heat from the oven and the hot plate, and could be ventilated into the open air or the existing flue. It was within his knowledge that several explosions at stoves had occurred through the use of a flue, especially where many elbows had been fixed. The condensation caused a scale of rust to form inside; and this in time dropped to the lowest point,

mostly an elbow, and the way became choked. Should a flue-pipe be required, however, he advised the use of a T-piece with a cap on the end, instead of an elbow, on any length of vertical flue, close to where it entered the chimney. He would not connect any flue direct from the oven to the open air. It was wrong, in fixing (say) a stove and a boiler, to couple the flues together by means of a T-piece. The better way was to run two separate flues—if flues must be used.

Mr. Smithers then dealt at some length with the subject of draughty chimneys. Down-draught, he said, was really the chief offender; but at the same time it was necessary to make sure that the trouble was caused in this way, as appearances were often deceptive. He quoted several instances in support of this contention, showing that sometimes the difficulty was caused by the fitter not carrying out his work properly. With a genuine down-draught, however, the method he adopted in the case of heating-stoves was as follows: Fill in the opening with sheet iron, either by means of a false register or entirely filling in the grate, as tightly and neatly as possible. Then conduct the flue through the sheet iron, and fit on an elbow and a length of flue-pipe with a cone on top. This was the cheapest method of combating the evil. As an alternative, a cowl might be fixed on the chimney outside on the roof. He had successfully dealt with some dozens of instances by means of the sheet iron and flue; but he did not recommend this course except where a defect existed. In the case of an up-draught, the first thing was to retain the heat that was being pulled up the chimney; and so he filled in the grate with the sheet iron, as before, for if that would keep the fumes from coming down it would also prevent the radiant heat from going up. No doubt they would find it tended to pull the draught up through the flue of the stove; but this could be easily altered by reducing the size of the flue or fixing on it a baffling-piece. The unusual trouble of sluggish up-draught he had often cured by fitting an additional length of flue-pipe, and occasionally two or three, to create an up-draught, at the same time filling in the grate with sheet iron. Open gas-fires in grates required different treatment. If an up-draught existed, he had found the fitting in of a piece of sheet iron to act as a register, with sufficient opening to allow the fumes to get away, an excellent remedy. In the case of a down-draught, the sheet iron register should be fitted, with an opening for a flue with a cone on top. This was not always possible on account of the construction of the chimney or grate; and the only thing was to fit a cowl on top of the chimney.

Coming to the concluding portion of his paper, Mr. Smithers remarked that in the making of a gas-fire in a grate care should be taken to form the clay or brick so as to get as much calorific power out of the gas as possible; for the greater part of the heat from the fire came from the clay or brick, and not from the ball fuel. The packing of fires should be carefully studied; for with the same burner and the same amount of gas 50 per cent. better results could be obtained if this was done in the most effective manner. Governors for fires and cookers, he thought, would come into great use in the future. At one time they were considered of little value where atmospheric burners were concerned, on account of firing-back, caused by sluggish or reduced pressure; but with a reasonable reduction to 15-10ths no trouble need be anticipated. He preferred to have the governor near the point of ignition, so that the pressure could be suited to each stove. The utility of governors for cooking-stoves was apparent to all who had seen the flames enveloping cooking utensils—absolute waste being thus caused.

In the course of the subsequent discussion, a number of questions were put to Mr. Smithers. Mr. S. Carpenter asked whether it was not a fact that if a governor was set (say) to 20 feet, when the fire was checked down below this consumption the governor was thrown out of action. The old fret fires were not mentioned in the paper; but he had found them to give most satisfactory results. With regard to the latest arrangements of air and gas regulation, was the author altogether in favour of the present plan of cutting down the gas supply to the extent that it was cut down; and also did he agree with building up the fuel so that the flame went right up through the centre, as compared with the old method of allowing the gas to play on the fuel, when it was almost pitched-in? The appearance with the old plan was, he (Mr. Carpenter) thought, much better. Mr. Hewitt inquired if the author had found any method of getting rid of the odours given off from the top burners of gas-cookers, when vessels were placed over the rings. Mr. W. J. Liberty asked whether Mr. Smithers discouraged the use of open fires with burners just put in and the grates then filled up with fuel. Did he now fix adjustable nipples with the stoves, so that the consumer himself could regulate the air and gas at will; and did he attach any contrivance (such as Thorp's) to the stoves, so that the consumer could see the amount of gas he was using?

Among other speakers, Mr. W. Grafton referred to the stove the late Mr. Sugg introduced many years ago, fitted with five or six burners, each having a tap, so that if a full fire was wanted all the burners could be lighted, while if a small fire was needed only one or two taps were lighted. In this way he thought a higher duty was obtained than by checking the consumption down as was done now. Certainly 15-10ths was far too low a pressure for domestic purposes. It was all right in olden days; but it was no use at the present time. When burners were turned down, it was impossible to induce sufficient air to enter to give the necessary mixture to produce a non-luminous flame; and without a non-luminous flame, perfect combustion could not be expected. One burner full on would give a much better result than a number of burners turned down.

Replying to the questions put, Mr. Smithers said that gas suppliers had to think for consumers who did not think or trouble for themselves. They would turn on the tap of a fire, and let it go, especially where perhaps money was not a great object; and this got the gas-fire into bad repute. Without a governor, after the fire had been alight some time, it was necessary to check the tap; but with a governor set to (say) 15-10ths, the fire could be lit and then left alone altogether. The consumer paid for the governor. If the taps were checked down to less than 20 feet, a governor set to 20 feet would be out of action. As to iron frets, one maker in particular still used them; and in his (the author's) opinion they were the most effective system of all. They were, however, not the most cheerful; and this was why they had not come to the front as they should have done. He did not approve of arranging the fuel so that the flame passed up between two rows, as in this case a chimney was made, and a lot of heat was lost. Fumes from a hot plate might be caused in several ways—from the flame or burner being in too close contact with the vessel, or through the utensil being dirty. People wanted to do things so quickly now that it was necessary to put in big burners. The result was a lapping flame all round the vessel, which was the chief cause of fumes. A fire-brick fitted in a grate would give 50 per cent. better result than an open grate without it. Adjustable nipples were not sent out with every stove, but only with those made on this principle. The Company did not send out with their stoves any appliance like Thorp's for checking consumption. The old fire referred to by Mr. Grafton was very good; but there was also another now on the market with which it was possible to have one-half or the whole of the fire alight. When fixing a fire in a grate, he always arranged to have the fire-brick leaning forward. He admitted that the non-lighting-back burners with slots did get soon choked up, but said he had not had a great number of complaints. He made it quite plain in his paper that he did not agree with the use of flues with cookers.

Mr. Grafton, in proposing a vote of thanks to Mr. Smithers, remarked that what was really wanted for cookers was a cavity in the wall, and immediately overhead a hole connected with the chimney—and not a metallic hood. The President said the paper had been a most interesting one, and they were all obliged to the author. Mr. Smithers briefly acknowledged the vote.

MANCHESTER JUNIOR GAS ASSOCIATION.

Visit to the Richmond Gas-Stove and Meter Company's Works at Warrington.

Dull, but fine and temperate, weather favoured the visit by the Manchester and District Junior Gas Association to the Richmond Gas Stove and Meter Company's works at Warrington on Saturday. Members of the Association are spread over Lancashire and Cheshire, and reached Warrington by different routes; but there was a general gathering at the Cheshire Lines Railway Station. Here conveyances were in readiness to take the party (about eighty in number) to the Company's foundry at Grappenhall, some 2 miles distant. This portion of the Company's works is in close proximity to the Latchford locks of the Manchester Ship Canal. The party had been met at the station by the Mayor of Warrington (Alderman Smethurst), Mr. Thomas Dwerryhouse (the Chairman of the Company), Messrs. H. M. Thornton, J. A. Ransome, John Coxon, J. W. Glover, J. W. Slack (Secretary), and other gentlemen; and on reaching the works refreshments were provided, following which there was a formal reception by the Mayor and Directors of the Company. Mr. Dwerryhouse presided. On his right sat the Mayor, wearing his chain of office; and on other seats were Mr. Thornton, Mr. E. J. Wellens (the President of the Association), Mr. A. L. Holton (Secretary), several Directors and officials of the Company, and others.

Mr. Thornton, in welcoming the visitors, said they were more than delighted to have the Mayor of Warrington with them on this occasion. This being the second year of Alderman Smethurst's mayoralty, they could judge how popular he was with the people of Warrington. They had also with them Alderman Pierpoint, the Chairman of the Warrington Gas Committee, who had come to join in the welcome. He (Mr. Thornton) asked the Mayor to welcome the Association.

The Mayor said it had given him great pleasure to be with them that afternoon, and to give all of them a hearty welcome to their good old town. They had need to be proud of gas engineers on account of the remarkable work they had done. He was sure the improvement during the last few years in the lighting of towns and in the uses to which gas could be put had been something wonderful. They had the Chairman of the local Gas Committee with them; and so far as they were concerned, gas had not suffered by the introduction of electricity. Both systems of lighting worked hand in hand. When the young men before him got into the position of managers of gas-works, he hoped they would be able to bring out something that would exceed what was at present produced from gas. He hoped they would have an interesting afternoon. It would be the pleasure of those who welcomed the Association there to show them what they could in the good old town of Warrington.

Alderman Pierpoint remarked that he was present as Chairman

One End of the "Special Apparatus" Department.

of the Gas Committee, in company with the Chairman of the Electricity Committee. They were not in deadly opposition. Each was interested in his respective department; but he had greater faith in the uses of gas. Warrington stood high in the manufacture of articles for gas consumption, and was proud of its eminence. Electricity and gas were struggling for supremacy; and it was for the man with the most inventive genius to distinguish himself in the adaptability of each to the service of his fellow men. He could only say how very glad he was to join with the Mayor in giving them a hearty welcome. He hoped they would enjoy themselves, and go home with a better opinion of Warrington than they might have had when they came. Gas and electricity might fight; but his wish was for gas to win.

Mr. Dwerryhouse joined in the welcome to Warrington and to the Richmond works, and said it was the latter he wished to show them that afternoon. He believed the firm had the best of everything in the way of gas apparatus. The land they had secured had plenty of water in it; and they were using it. Warrington, he was glad to say, was not benefiting by the works' water supply.

Mr. Coxon, one of the Directors, added a few words of welcome, after which,

Mr. Wellens expressed the thanks of the members for the distinguished welcome which had been extended to them. They were juniors now; but they all hoped to rise in their profession. The number of members present that afternoon showed the interest they felt in the visit.

Mr. F. Thorpe said that this was a red-letter day in the history of their Association, and every Junior Gas Association in England and Scotland would be pleased to read in the Press of the welcome given to them by the Mayor of Warrington. Warrington would always stand high in the estimation of the gas engineering world. The Richmond Company was the genius of business adaptability, and the Fletcher Russell Company the genius of experiment. They hoped these two firms would go on in their work and bring out new things, and so keep on elevating the gas profession. He moved a hearty vote of thanks to the Mayor for his attendance.

Mr. H. H. Mercer seconded the motion; and it was carried, with enthusiasm.

The Mayor briefly acknowledged the vote.

The party then moved off; and the engine-house, mixing-mills pattern-stores, foundry, huge stacks of pig-iron, &c., were visited in turn. Swarms of workmen were busy. A most interesting function was the casting of a special paper-weight, suitably inscribed, as a memento of the occasion. Each visitor poured out the molten metal into his own mould. The foundry is of very large extent. It stands isolated among open fields; the site of the works and the Company's still unoccupied land covering about 9 acres. One side of this acreage is bounded by the banks of the Ship Canal. The moulding shed is replete with every convenience for the transit of molten metal from the cupolas to the moulds. The overhead trolley system forms a sort of network

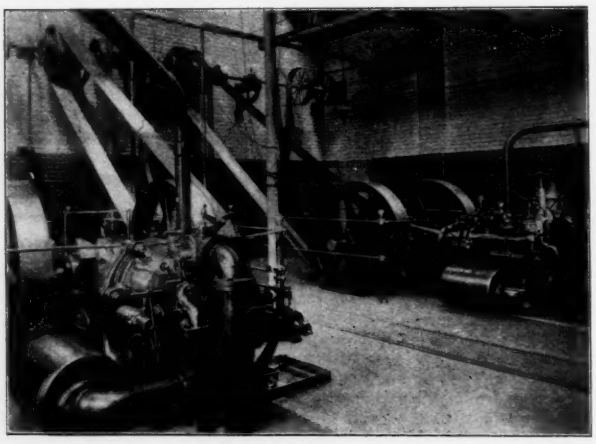
The Foundry at Grappenhall.

A Dinner-Hour Group at Grappenhall.

among the girders of the roof, under which broad gangways exist for the convenience of the workmen in dealing with the metal. There is ample roof lighting for day work; and after dark artificial light is provided by the Keith high-pressure incandescent gas system.

The engine-house was spotlessly clean; and a pair of fine 70-H.P. Tangye gas-engines were in full work. These supply the power for driving the machinery. The two cupola furnaces are capable of melting from 10 to 12 tons of iron per hour. A powerful Roots blower provides the blast. Near the engines are air-compressors for pneumatic power.

The core-making and drying rooms are very extensive. A large number of women and girls were busily engaged at core-making. These cores are dried in two large special stoves capable of dealing with thousands a day. Adjoining the foundry are the dressing or "fettling" shops, which are provided with tumbling barrels, emery wheels, and other conveniences for cleaning the castings, which are thoroughly inspected before being sent into the stores.



A Corner of the Engine-House at Grappenhall.

The members having concluded their inspection, re-entered the carriages in waiting, and were driven to the Academy Street Works in Warrington. These works seem still more extensive than the others. Here the processes of fitting and completing the finished articles were in progress. The hands of the firm, about 1000 in number, had kept at work during the afternoon for the pleasure of the visitors. It is worth while mentioning at this point that the Richmond firm only began their career in 1891. Passing through the grinding and polishing departments, and noticing the range of stamping and metal-shaping machines by the way, the party reached the lower fittings shops. These have been specially arranged and fitted up to deal with their extensive production of prepayment cookers. On this floor is a separate department devoted to the fitting of gas-bars, loose and fixed, for the hot-plates of the various types of cookers. Scientific accuracy and efficiency being more and more essential in this as in most industries, specialization in detail working tends ever to multiply departments.

In the general fitting shops, a very varied array of work was going on. High-grade gas-cookers, such as the "Model" and the "Crusader," were seen side by side with ranges of Colonial and Continental type, of which large numbers are now being made. Fires of all descriptions, including the present season's "A.B.C." series, were most in evidence. Grillers and hot-plates of numerous patterns, and, last but not least, the gas-steam radiators were also to be seen. The floor above is wholly occupied by the tin and coppersmiths' department, where the same wide range of work was in progress, from the humble, but useful, griller tin to the largest copper boiler and water heater for hotel and public institutions. Among these may be mentioned water heaters of the rapid types for baths and lavatories, circulating heaters, washhouse boilers, and greenhouse heaters. In passing, mention may be made of the blacking, finishing, and bronzing and plating departments, where the various art-colour finishes on iron and copper goods are produced; *repoussé* copper for fire decoration being also noticed.

An important stage in the production of good cookers and fires is the testing; and here was noticed the care with which this department has been arranged, equipped, and controlled. The ordinary gas pressure from the town's mains being necessarily variable to some extent at different times of the day, this department has been rendered quite independent of such variation by the installation of compressors, by which a constant pressure of any ordinary amount may be maintained; so that while the patent gas and air adjusters give power of correction to suit any circumstances, the best normal efficiency is given to every separate burner before leaving this department. From the testing department, those goods which are for immediate orders pass to the shipping department on the floor below; otherwise they pass to the store-rooms, through which the visitors proceeded on their way to a temporary show-room, in which a few finished productions of the firm in the various classes had been arranged. Many finished cookers and other apparatus were seen ready for despatch. The show of finished goods was examined with much interest; the design, finish, and general utility and simplicity being freely and favourably commented upon.

The special apparatus, enamelling, pattern, and design departments were very interesting. The designs being decided, the models are commenced in either clay, plaster of Paris, or wood, from which they are cast into a soft metal composed of lead and tin, which can be bent, cut, and soldered in any way, until a thin, light pattern, true in all respects, is obtained. These patterns are preserved on wood blocks—iron patterns for regular work being cast therefrom as required.

The special apparatus department is located in a separate building of the works, with pattern moulding and other stores on the opposite side of Academy Street; power being derived from another gas-engine. A range of dining-car suites attracted much attention; and these, added to large boiling tables, hot closets, and boilers for the equipment of the dining hall of large engineering works, gave a very busy air to this part of the works.

The enamelling department, being in another quarter of the town, time did not permit of a visit; but it was said to be splendidly equipped for turning out the best possible work of its class. The many samples of its work seen, both in the Academy Street stores and upon and about the various cookers and fires seen on the round, and especially in the show-rooms, confirmed the reputation which this finish has obtained. If we might particularize, we would refer to the "Porcellanite" finish on the fires as being specially noticeable.

While in the show-room, Mr. Thornton said the firm made a point of standardizing the parts of cookers and fires. Everything was interchangeable. As an illustration, two of the cleverest fitters of the firm took to pieces two stoves, mixed the parts, and re-built them in about 20 minutes. Mr. Thornton also informed the visitors that double domes in gas-cookers were found to save some 10 per cent. of gas.

At the conclusion of the inspection of the works, Mr. Thornton delivered a short address. He said he was very glad to meet the members of the Association at Warrington that day. The more they saw of everything that related to gas manufacture and its appliances, the better prepared would they be to face their customers. He was of opinion that there should be very much greater co-operation between the producers and the manufacturers. There had not been in the past that mutual co-operation in this matter which there should have been. He thanked them for coming to see the Richmond works. Their thanks were also due to the employees for working on a Saturday afternoon.

Mr. E. J. Wellens returned the thanks of the Association to the Directors of the Company, who had come from London in order to meet them and to impart to them so much interesting information.

The visitors were then driven to the Patten Arms Hotel, where tea was provided—Mr. Ransome occupying the chair. After tea a smoking concert was held; and a number of toasts were given and responded to.

A GRATING PHOTOMETER.

A preliminary description, by Herr W. Biegon von Czudnochowski, has recently been published in the "Journal of the German Physical Society," of a new form of grating or shadow photometer, which is claimed to be capable of giving extremely accurate readings. The object used to cast the shadow is a grating of narrow mesh, the wires of which are inclined at angles of 45° to the vertical. The two sources of light that have to be compared are disposed on the same horizonal plane on the one side of the vertically supported grating, while on the other side is a screen of matt glass. The lights therefore cast a pair of images of the grating upon the screen; and the distance between the screen and the grating is so arranged that the individual bars of shadow are at the same distance apart. The angles at which the light rays impinge on the grating and the screen are also so arranged that the right eye of the observer is in the axis of the rays proceeding from the left-hand light, and the left eye in the axis of the light coming from the right-hand source. This causes each eye to see only one set of shadows distinctly—a stereoscopic effect being produced. When the two images coalesce, the observer seems to see a single set of bars in space, the components of which appear to lie in different planes until the two lights have been so adjusted as to cast equal illumination upon the grating. By the employment of suitable reflecting mirrors or prisms, the whole optical system can be erected upon a bar photometer.

NATURAL AND ARTIFICIAL PURIFYING MATERIAL

By Dr. L. J. TERNEDEN, of Amsterdam.

More than a year has now passed since the first experiment with the Lux purifying material was instituted at the West Gas-Works, Amsterdam. Though the time is short, it has nevertheless appeared already that the new purifying material is giving better results than those previously obtained when natural Dutch bog ore was employed. The author had therefore contemplated making a brief reference to the subject at the last meeting of the Dutch Association of Gas Engineers held at Leyden; but on further consideration, he thought it was better to postpone dealing with the matter until more figures and experience had been collected. Now, however, he feels that the time has come to publish the results of the year's working with the new material.

It is well recognized that the varying composition of the bog ore supplied in Holland militates seriously against its successful employment on gas-works. Each delivery has to be separately examined, and shows itself when in actual use sometimes better and sometimes worse than was expected. If the amount of iron present in an available form is determined analytically, uncertainty as to the actual value of the material still remains; for its efficacy in the purifier depends upon the form in which the iron is present. Indeed, the author would often rather trust to the appearance of the material as a guide to its practical value than to the results of analysis, although a mere inspection by an experienced man is nevertheless liable to deceive. Hence it follows that every delivery of bog ore requires treatment in a particular manner if the best and most economical results are to be obtained from it. The Lux purifying material is free from this defect. Certain difficulties admittedly accompany its use; but when these are understood and allowed for, the manner of treating it is always the same. In bog ore the amount of iron present, or the corresponding amount of ferric hydroxide—if it is assumed that all the metal exists in the form of $Fe_2(OH)_6$—varies very seriously. Part of it occurs in a state of impalpable powder, as well as in granules of appreciable size; while the size of the grains themselves is not always the same. The ore can be sifted so as to obtain grades of material more uniform in dimensions, and the hard lumps, which are deficient in purifying power, can be broken down by appropriate grinding, But when this is done, they still retain their bad qualities.

The irregular nature of bog ore can hardly be wondered at in view of the different beds whence it is derived, and the limited supply. It is quite possible that some bog ore, having the good qualities of the material offered for sale in the past, still remains; but the supply will undoubtedly be exhausted sooner or later. The author does not care, on his own responsibility, to prophesy the date when deliveries of Dutch bog ore will no longer be obtainable; but when he made inquiries on the subject in the trade, he was told by two authorities that the ore now known to exist would only last for another fifteen years. Matters are very different with the Lux purifying material. This is invariably prepared in the same manner; and if the preparation is conducted with the necessary skill, its properties are always identical. The raw material from which it is made is bauxite, a mineral known to occur in large quantities. The following analyses of three deliveries made at different times of the year may be of interest.

	Water	Iron in the Dry Material Calculated as $Fe_2(OH)_6$.
January	57·1 per cent.	89·6 per cent.
August	56·5 ,,	88·7 ,,
December	56·1 ,,	90·3 ,,

The proportion of water is high. In bog ore it stands at about 49·7 per cent., 51·1 per cent., and 49·9 per cent. The extra amount in the Lux material, however, cannot be regarded as a disadvantage if allowance is made for it in the price.

It is not altogether an easy matter to submit figures showing, in a strictly comparable manner, the results that have been obtained at the West Gas-Works at Amsterdam with the two purifying materials. The difficulty arises through the fact that ten to twelve parcels of material are in use simultaneously, travelling backwards and forwards between the purifiers and the revivifying floors. [The author employs the word "parcel" to signify the quantity of material which is kept together as far as possible during its employment.] Hence it cannot be said with absolute precision that one particular parcel of material has purified a stated volume of gas, because different purifying vessels, and therefore different parcels of material, are in use at the same time. For this reason, the author prefers to give the next figures as indicating his opinion upon the relative merits of the two materials.

Lux Material.—After being used the stated number of times, different parcels of the Lux material contained the following proportions of sulphur calculated upon the dry substance:—

Parcel No. 13	used once	43·2	per cent.	of sulphur
,, ,, ,,	,, twice	56·5	,,	,,
,, ,, 2	,, once	44·4	,,	,,
,, ,, ,,	,, twice	47 0	,,	,,
,, ,, 3	,, once	38·1	,,	,,
,, ,, ,,	,, twice	35·9	,,	,,
,, ,, ,,	,, three times	49·1	,,	,,
,, ,, ,,	,, four ,,	54·7	,,	,,
,, ,, 6	,, once	32·8	,,	,,
,, ,, 7	,, ,,	30·5	,,	,,

Parcels Nos. 2 and 3 had to be taken out of the purifiers after being used twice, owing to their excessive absorption of pressure. The reduction in the amount of free sulphur was due to the fact that after its removal from the vessels the material caught fire. Flames rose to some height from the material, and naturally represented the loss of much sulphur, which was apparently converted into forms incapable of recovery.

Bog Ore.—The following are the corresponding figures relating to bog ore:—

Parcel No. 10	used once	20·6	per cent.	of sulphur
,, ,, ,,	,, twice	37·6	,,	,,
,, ,, ,,	,, three times	35·6	,,	,,
,, ,, 11	,, once	12·7	,,	,,
,, ,, ,,	,, twice	16·7	,,	,,
,, ,, ,,	,, three times	21·5	,,	,,
,, ,, ,,	,, four times	27·1	,,	,,
,, ,, ,,	,, five times.	29·6	,,	,,
,, ,, 12	,, once	9·3	,,	,,
,, ,, ,,	,, twice	15·1	,,	,,
,, ,, ,,	,, three times	19·0	,,	,,
,, ,, ,,	,, four times	20·9	,,	,,
,, ,, ,,	,, five times.	23·8	,,	,,
,, ,, 7	,, once	21·9	,,	,,
,, ,, ,,	,, twice	25·7	,,	,,
,, ,, ,,	,, three times	30·0	,,	,,

After the third time of using parcel No. 10, it diminished somewhat in its sulphur content. The loss, however, was to some extent only apparent, inasmuch as the proportion of blue had increased a good deal, so decreasing the figure for the sulphur. It should be understood that differences of 1 per cent. in the above figures are to be expected owing to the manner in which the samples were taken.

The general result of the tests is to show that the Lux material packs better than bog ore, even when freshly loaded into the purifying vessel; so that it reaches a higher sulphur content during its first employment. Moreover, the author has never obtained so high a final proportion of sulphur in his spent bog ore as in the spent Lux material. Very old samples of bog ore have given him such final proportions of sulphur as 40·6 per cent., 33·7 per cent., 39·4 per cent., and 36·0 per cent. But these were materials which had been used six or seven times. At first sight, it may appear advantageous that one and the same quantity of bog ore can be used six or seven times; whereas a given quantity of Lux material can only be employed two or three times. The real question, on the other hand, is which material will take up more sulphur in the shorter time, thus involving as little revivification as possible, because this means a reduction in the expense of labour. In the year 1906, one purifying vessel, composed of four smaller vessels arranged in parallel, at the West Gas-Works was charged 41 times. During 1907, when, after January, one section was charged with Lux material and, after August, two sections were charged with Lux material, the purifier was refilled only 30 times. In other words, between Jan. 1 and March 10, 1906, when only bog ore was employed, eleven purifiers required emptying and recharging at the West Gas-Works; between the same dates in 1907, when the use of Lux material began, nine purifiers had to be emptied; and between the same dates in 1908, when a larger proportion of Lux material (but still not the entire quantity) was in service, only seven purifiers needed refilling. Hence if the use of bog ore were entirely superseded, the operations of emptying and recharging should become even less frequent than they are now.

The cost of labour for purification, including revivification during 1906 was 10,093 fl., and during 1907 was only 8293 fl.; thus showing an economy of 1800 fl. At the East Gas-Works, where experiments with the Lux material have also been undertaken, the cost of labour for purification in 1906 was 7670 fl., falling to 5726 fl. in 1907. At this works, the Lux material has only been used in the catch purifiers in order to remove the last traces of sulphuretted hydrogen. It does this more perfectly than bog ore, and has therefore proved very satisfactory.

The author has also attempted to obtain an opinion upon the relative merits of the two materials in a different manner, by calculating the amount of sulphuretted hydrogen retained, from the weight of the individual parcels of material and the proportion of sulphur contained in them. The results are only approximate, inasmuch as the sulphur present in a state incapable of regeneration, and also that consumed in the production of thiocyanogen, is not allowed for. Furthermore, the quantities of gas passed through each parcel can only be estimated on the assumption that the make was divided evenly between the two sets of purifiers. This naturally is not quite correct, as a lower pressure absorption in one set would cause less than half the gas to pass through the other. The figures are as follows:—

	Free Sulphur Absorbed, Kilos.	Gas Purified, Cubic Metres.	Grammes* of Sulphuretted Hydrogen removed per Cubic Metre.	No. of Days in Use.
Parcel 13 (Lux)	55,210	9,153,780	6·4	202
,, 2 ,,	27,696	2,843,400	10·2	58
,, 3 ,,	45,097	6,392,095	7·5	104
,, 6 ,,	17,130	1,975,060	9·2	31
,, 7 ,,	16,008	915,485	18·6	14
,, 12 (bog ore)	26,719	4,300,925	6·6	69
,, 11 ,,	16,600	3,963,090	4·5	62
,, 7 ,,	25,737	3,720,515	6·9	60

[* One gramme per cubic metre is equal to 43·7 grains per 100 cubic feet.]

In the case of parcel No. 7 of the Lux material, the amount of

sulphur taken up per cubic metre of gas is very high; but the figure is not impossible, as the proportion of sulphuretted hydrogen in the English coal used may reach 26 grammes. Probably, however, this is an instance where one of the two sets of purifiers was more heavily worked than the other. The results appear to the author to be rather in favour of the Lux material.

The question remains whether there are any inconveniences in the employment of the Lux material. The material is in a very fine state of subdivision. Its particles are not ground mechanically, but it is obtained in the condition stated by chemical means. This explains the very active nature of the substance, and also the extreme readiness with which it catches fire when the purifier is opened—in fact, it revivifies quickly. If, however, this peculiarity is borne in mind, no further trouble arises. During the experiments at Amsterdam, no fire has occurred while the material was in the purifier, because it was thoroughly wetted immediately the lid was taken off. Care must be taken, on the contrary, that it is not too wet when charged afresh, else its particles may stick together and establish a high pressure absorption. At the present time some tests are being made with mixtures of bog ore and Lux material; the idea being to avoid the high absorption of pressure and diminish the intensity of the revivifying action.

These are the results of the experiments that have hitherto been carried out at the West Gas-Works at Amsterdam with the Lux purifying material. Over and above the advantages indicated by the foregoing figures, the employment of the material has increased the author's confidence in his purifying plant. The higher prime cost of the material has been neutralized by economies in labour.

GOVERNING AND REGULATING GAS-ENGINES.

At the Meeting of the Institution of Mechanical Engineers on Friday, a paper on "The Governing and Regulating of Gas-Engines" was read by Mr. JAMES ATKINSON, who is connected with the firm of Messrs. Crossley Bros., Limited, of Manchester. The following are some extracts from the paper.

The continuous increase in the size of gas-engines and the widening field for their employment have necessitated various modifications in their design and methods of operation; the question of their regularity of turning and closeness of governing being by no means the least important causes of these modifications. Methods of governing gas-engines may be divided into two classes. In the first, the volume of the charge remains constant, and sufficient to fill the cylinder as nearly as possible at atmospheric pressure; but the proportion of gas to air is varied according to the load. In the second, the proportion of gas to air is kept approximately uniform, but the volume of the charge is varied, either by closing the admission-valve before the end of the suction stroke or by throttling; the result in either case being a charge sufficient to fill part of the cylinder only at atmospheric pressure. The first method is commonly called the "quality" method, the latter the "quantity" method. The former may be subdivided into hit-and-miss governing, variable gas admission uniform during the suction stroke, and variable gas admission caused by opening the gas-valve earlier or later during the suction-stroke, but always closing it at the end of this stroke; the contents of the cylinder when reduced loads are being carried being to some extent stratified, air being next to the piston and a rich mixture drawn in last, remaining near the firing-point. The quantity method of governing may be divided into throttle governing and cut-off governing. With one or two unimportant exceptions, all types of governing are included in the above.

For many years hit-and-miss governing was universally and exclusively employed; and it still remains the usual method for small or moderate-sized engines. So far as the author is aware, its economy has practically never been excelled; being only equalled on full loads by very carefully arranged methods, while on light loads it is still necessary to combine hit-and-miss governing with other methods to obtain such results.

As usually constructed, the governor decides whether there is to be a hit and a miss by the fact of one knife-edge passing on one side or the other of a second knife-edge, practically by a hair line, and the same hair line on all loads. The governor itself, therefore, always governs when in one position; and it does not much matter if it is very far from being isochronous. Also, as it has little actual work to do—the parts to move being very light and having scarcely any resistance to overcome—a very small governor will effectually control a large engine. The closeness of governing or the mean variation of speed on varying loads with an engine having a fairly heavy fly-wheel, can easily be kept within 2 per cent. from the full load to any load. Gas-engines fitted with hit-and-miss governing are so arranged that if the engine pulls up on the load from any cause, the operating gear for opening the gas-valve is drawn out of contact as the engine slows down and before it stops. Thus the engine cannot stop with the gas-valve open. This precaution is absolutely necessary for the safety of engines liable to be left for long periods by the attendant, and drawing their air charges from the engine-room.

The ordinary hit-and-miss gear is well known; but an improvement had recently been made in it. The author described this by the aid of a diagram. Another diagram showed some consumption lines for engines governing by hit-and-miss.

Referring to the latter diagram, the author said: It is interesting to note that the lines showing the total consumption per hour are practically straight; being in this respect similar to what is known as the "Willans" line for steam-engines. It is unfortunate that the particulars given in these and in other tests are comparable only with themselves and not with each other, owing to the constant and great variation in the calorific value of the Manchester gas, which during the last two or three years has constantly fluctuated from less than 500 to over 600 B.Th.U. per cubic foot (on the lower scale), as tested in a Junkers calorimeter, often varying 30 or more units during a test, and by a larger amount from day to day. These tests are for three different-sized engines; the smallest giving about 14 B.H.P. as a maximum, the next about 47 B.H.P., and the largest 100 B.H.P.

Quality governing by admitting the gas in varying quantities continuously throughout the suction stroke is not generally adopted, though some very large engines have been controlled in this manner. The extent to which variation in richness of the mixture can be carried out in this way is somewhat limited. If the charge is either too rich or too weak, it will not ignite freely but will burn slowly; and in either case a point is very soon reached when it burns so slowly as to continue still inflamed during the whole of the exhaust stroke, and until the commencement of the suction stroke, when the fresh charge drawn into the cylinder is fired by the smouldering flames still lingering there, and an explosion takes place while the admission valve is still open—resulting in burnt products being driven into the air and gas mains, sometimes causing the next or second charge to be vitiated, so that two full working strokes are occasionally spoiled in this way. When the engine is always working on full load, or almost full load, this method of governing can be used successfully; but for engines which have to govern throughout the full range of work from full load to no load, it is not found to be at all satisfactory.

Variable admission of gas caused by opening the gas-valve earlier or later during the suction stroke, but always closing at the end of this stroke, is a method of governing which is rapidly coming into use, and is a most satisfactory method, at any rate for large gas-engines. By admitting the air and gas in this way, when working on light loads, air only is first drawn in; the gas being admitted towards the end of the suction stroke. The result is that part of the charge next the piston does not contain any gas, or at all events a very small proportion, but the part near the ignition-point has sufficient to make it freely ignitable—there being what is known as stratification throughout the cylinder during both the suction and the compression strokes. A very considerable proportion of the large gas-engines recently made have been governed in this manner—including all of the Oechelhaeuser and Körting types, in which it is practically necessarily adopted; also a number of double-cylinder engines, which unavoidably have considerable inertia in the reciprocating parts.

The author's firm having recently constructed some tandem engines of 500 to 600 H.P., the question as to the method of governing them had to be considered. It was decided that on the first engine a governor-valve operated by a trip-gear should be applied to one cylinder, and a novel type of governor to the other; the intention being to adopt permanently the kind which proved to be most satisfactory in working. The result was that the trip-governing gear was abandoned and the other adopted; it proving to be more simple, more prompt in action, considerably cheaper, and thoroughly reliable. With this gear, all that the governor has to do, when governing a tandem-engine with two single-acting cylinders, is to move two small cylindrical plugs which are an easy sliding fit in their cylinders; the plugs themselves being always in equilibrium, with the result that prompt and certain control is always ensured. The vacuum pistons, the springs, and the other moving parts, are all enclosed and shut off from communication with the gas; consequently any tar or dust can only gain access to the gas-valve, which is so formed that its movement cannot be clogged. The mechanical parts are also constructed so that any wear will be infinitesimal. The actual operating medium is atmospheric air, which is costless and indestructible. A further advantage of this gear is that it is perfectly noiseless, with the exception of a slight hissing due to air entering and leaving the vacuum cylinders. This noise could, of course, be easily prevented; but as it is an audible indication of the working of the valves and the load on the engines, it is of considerable service in supplementing the visible indicators above referred to.

A report by Dr. Nicolson, Professor of Engineering at the Municipal School of Technology, Manchester, shows that the maximum variation in speed from full load to practically no load was only $1\frac{3}{8}$ per cent.; being obtained with a movement of the governor plugs of about half-an-inch. It is quite possible to reduce this to (say) one-eighth of an inch by causing the plugs to open and close cylindrical narrow ports, instead of round holes. In this manner, the speed variations might be reduced to almost nothing. In most cases, however, a speed variation of $1\frac{1}{2}$ to 2 per cent. is preferable.

It is, of course, an essential point in connection with governing gear that the economy of the engine should not be interfered with; and it is satisfactory to note that in the tests above referred to a remarkably low consumption was obtained. The gas was manufactured from bituminous coal in a Crossley plant. A sample was analyzed by Dr. Nicolson, and gave the percentage figures shown in the following table.

Carbon dioxide	11·4
Unsaturated hydrocarbons	none
Oxygen	1·0
Carbon monoxide	15·1
Hydrogen	24·3
Methane	3 5
Nitrogen (difference)	44·7

The calorific value on the lower scale works out to 156·5 B.Th.U. per cubic foot, at 0° C. and 760 mm. pressure. The gas was also tested in a Junkers calorimeter during the time of the trial; the gas being taken from close to the inlet of the engine. The result was 149 B.Th.U. per cubic foot on the lower scale, at atmospheric temperature and pressure—according very closely to the heat value given by the analysis. The engine was running on a brake load of 559 H.P.; and the gas consumption per B.H.P., reduced to 0° C. and 760 mm., was 51·94 cubic feet per B.H.P. per hour. The heat supplied was 8128 B.Th.U. per B.H.P. per hour. The thermal efficiency on the brake was therefore 31·32 per cent. So far as the author is aware, this is the highest efficiency that has ever been obtained in a large gas-engine in any well-authenticated trial. The same method of governing has been successfully applied to smaller engines, in which the gas-valve has been arranged independently of the main admission-valve, and combined with hit-and-miss; this arrangement being more suitable for the smaller type of engines.

Quantity governing, as represented by suddenly cutting off the charge, has been adopted in some instances; a very common method being to use cut-off gears, practically identical with similar gears as used with steam-engines. These have been successful in practice; but unfortunately they necessitate in most cases trip arrangements which require heavy and powerful governing gear, together with somewhat noisy operation and considerable wear and tear. A method of operation which is being used by the author's firm in certain instances bears some resemblance to that previously described for large engines; being pneumatically controlled by a cylindrical plug opening and closing a small passage communicating from the atmosphere to a vacuum to the cylinder. In this case, however, the vacuum is used to restrain the closing instead of the opening of the valve. The cut-off valve consists of a conical part directly connected to the vacuum piston, and having a number of annular ports which open and close corresponding annular ports in a conical seat. At the commencement of a suction stroke, the ports are open; the vacuum piston being always returned to this position by the external adjustable springs. If the governor plug closes the communication, the valve remains in the opened position throughout the suction stroke, because no air can be drawn into the vacuum cylinder; and the engine draws in full charges and gives full power impulses. If, however, the little plug opens the communication more or less, the suction of the engines causes a suction on the cut-off valve and piston, drawing a little air into the vacuum cylinder, and allowing the cut-off valve to move so as to cut off the charge earlier or later, according to the extent of the opening of the communicating passage.

Throttle governing has been very largely used; vertical high-speed engines, as well as large numbers of single-cylinder horizontal engines, being almost universally controlled in this manner. As applied to vertical engines, the usual method has been to throttle a uniform mixture into a pipe from which each cylinder draws its charge; the mixture in this pipe being nearly at atmospheric pressure for full loads, and various pressures below the atmosphere for lighter loads. One objection to this arrangement is that if, from irregular working in any of the cylinders, a back-fire takes place, the contents of the pipe itself are fired; thus fouling the charges for the other cylinders, and causing imperfect action in them also. As a remedy for this, the author's firm have adopted an arrangement in which the gas and air are separately throttled into different pipes communicating with the cylinders; the gas and air being kept apart till they pass through the admission-valves into each cylinder, where also there is an independent gas-regulating cock. The gas-cocks enable the cylinders to be regulated independently, or even in emergency shut off.

The gas and air throttle-valves are arranged on the same spindles, and they can be rapidly drawn out for cleaning or inspection. The throttle-valves themselves have four cutting-off edges; those in the air-throttle being similar. In the gas-throttle, however, two of them are similar to those of the air-throttle to be used when the engine is running on producer gas; but the other two are arranged with inclined surfaces of such a shape that they give suitable proportions of gas areas to the air areas when working with rich illuminating gas. Throttling governing is frequently applied to single-cylinder small and medium-sized engines, which represent so large a proportion of the gas-engines made. One objection to all kinds of quantity governing is that powerful springs are required on the admission and exhaust valves, as very commonly the partial vacuum in the cylinder is as low as 9 lbs. below the atmosphere. Gas-engine valves invariably open inwards, and a large valve requires a strong spring to prevent its being opened by a suction of 9 lbs.

Good governing is only one of the requirements in gas-engines. When extreme regularity is necessary, more than one cylinder and heavy fly-wheels containing a considerable amount of inertia are also needed. In designing gas-engines to make them so that they will not exceed a definitely stated amount of irregularity, careful estimates have to be made as to the effect of the number and disposition of the cylinders, the power of the impulses, the inertia in the fly-wheel, and the effect of the inertia of the reciprocating parts and of the compressions.

The author gave a number of curves which had been carefully prepared for the different arrangements in common use and under ordinary conditions; and also the following table. It gives in column 1 the type of engine; in column 2, the areas between the curves of turning efforts and the mean working lines from which the excess or the deficiency of work done can be estimated (these areas being given relatively to a single-cylinder engine, which is taken as 1); in column 3, the mean pressure per square inch on the piston throughout a working stroke which would give an amount of power corresponding to the excess or to the deficiency; in column 4, the speed variation expressed according to the formula $\frac{\text{Maximum}-\text{Minimum}}{\text{Mean}}$, assuming that the kinetic energy in the fly-wheel at mean speed is 30 impulses; and in column 5, the difference in degrees the fly-wheel of the engine would be ahead of or behind a wheel of constant speed. He also explained how the particulars had been obtained.

1	2	3	4	5
				Deg.
Single cylinder	1·000	106·30	$\frac{1}{49·9}$	1·8
Vis-à-vis	1·290	138·00	$\frac{1}{38·5}$	2·33
Tandem	0 836	88·60	$\frac{1}{59·7}$	0·75
Double tandem	0·129	13·75	$\frac{1}{383·3}$	0·06
Three cylinder	0·716	76·17	$\frac{1}{69·5}$	0·42
Six cylinder	0·144	15·50	$\frac{1}{338·3}$	0·044

Speed variation is the important factor when considering gas-engines as employed for most purposes; but for the special purpose of driving alternators in parallel, also for some other uses, speed variation is only one of the factors which have to be considered. It is necessary to combine it with a time element, and thus obtain the position variation—a point which is very frequently overlooked in this connection. It will be seen by comparing columns 4 and 5 that there are some very considerable differences in the relative variations of the different types of engines; and yet it is most unusual for anyone to ask for anything but speed variation when inquiring about an engine. A notable feature emphasized by the table is the excellent result which can be obtained by a double-tandem single-acting cylinder engine—that is to say, one having four single-acting cylinders operating on to two cranks.

PRESSURE IN INVERTED BURNERS.

As a kind of appendix to the monograph, on the phenomena prevailing in inverted burners, which was published by Dr. Bunte about a year ago, Dr. W. Wedding, of Gross-Lichterfelde, has carried out some experiments upon the pressure obtaining in different parts of the tubes of inverted burners, and has given an account of his investigations in a recent issue of the "Journal für Gasbeleuchtung," accompanied by numerous curves showing the distribution of the pressure in the actual burners he tested.

In order to measure the very minute variations in pressure in the burner-tubes, Dr. Wedding used a form of gauge he terms a "pressure level." Instead of being a tube bent upon itself into the shape of a U, and so having two arms standing upright, his gauge consists of a straight length of glass tube bent at the centre into the form of an extremely wide V; the angle between the two branches indeed being as much as 178°. In other words, the gauge consists of an almost horizontal length of tubing with a slight dip at the centre, and partially filled with coloured water as usual. It is carried on an upright stand, which can be accurately levelled, and is provided with graduations on a scale behind. In using the instrument, the movements of the liquid are noted at one end only; the other end being connected to a length of rubber pipe, to which a piece of very fine tubing is attached to serve as a "probe." The probe is pushed up, through a hole in the mantle if necessary, from beneath into a burner-tube, so that the pressure obtaining at different points along its longitudinal axis can be measured. The level is first of all calibrated against an ordinary pressure-gauge, so as to obtain a constant by which its readings have to be multiplied in order to convert them directly into millimetres of water column. In the actual instrument used by Dr. Wedding, a lateral displacement of the liquid equal to 0·25 mm. was found equivalent to a change in pressure of about 0·01 mm. vertically.

Some preliminary experiments were performed with the aid of this instrument upon dummy burner-tubes made up of glass in dimensions imitating those used in the construction of inverted burners. The tubes were also provided with lateral openings at two or three positions along their major axes, so that, inserting

the probe of the gauge through them, the pressures at various positions about one particular cross section of each tube, and at different distances from the centre, could be measured. The first burner-tube tapered from a diameter of 15 mm. close to the nipple to one of 11 mm. close to the supposed place of ignition; the whole length being 150 mm. The second tube increased in diameter from 11 mm. close to the nipple to 14 mm. at the base; its length being the same as before. The pressure of the gas on the service side of the nipple was 38 mm.; so much being lost by its passage through the five holes of the jet that at a central point 14 mm. below the nipple only 2 mm. of pressure remained, which, owing to the friction of the gas particles among themselves and against the walls of the tube, fell to approximately 0·1 mm. at the centre of the final orifice.

As might be expected, the pressure in the second tube remained approximately twice as high throughout its entire length; the pressure at the outlet being 0·2 mm. At a point 44 mm. below the injector of the second tube, the pressure ranged from 0·2 to a little over 0·3 mm. at a distance of 1 mm. from the wall of the tube, rising to a maximum of nearly 0·7 mm. in the centre. At a point 92 mm. below the injector, the pressure ranged between 0·1 mm. or a little more close to the walls, to a maximum slightly exceeding 0·3 mm. in the centre; and at a point 130 mm. below the nipple the pressures ranged from 0·05 mm. at the edges to a little over 0·2 mm. in the centre of the tube. When the 5-hole nipple previously employed was replaced by one having only a single hole, the loss of pressure was a good deal less; the maximum pressures in the centre of the tube at the three distances along its length already mentioned being respectively 1·2 mm., 0·6 mm., and under 0·5 mm. The curves, indeed, representing the pressure over the cross section of the tube, were much steeper when a one-hole nipple was used than in the previous case.

In a third experiment, a gauze was inserted in the second tube at a distance of about 110 mm. below the nipple. The curve indicated the fall in pressure throughout the length of the tube when no gauze was present was smooth; the actual central pressure at the place subsequently occupied by the gauze being about 0·3 mm. When the gauze was inserted, the pressure curve remained higher at all points above the gauze; being actually 0·5 mm. on the injector side of the gauze itself. Passage through the meshes caused a sudden reduction in pressure; so that the curve bent sharply and crossed the former curve—the pressure at the outlet of the gauze and at all positions down to the final orifice being only one-half what they were in its absence. A fourth series of experiments was instituted upon a model burner-tube increasing in diameter from 12 mm. at the base of the mixing-chamber below the nipple to 14 mm. at its orifice. Towards the lower part it was provided with a bulb 24 mm. in diameter, in which a gauze could be placed; and it was also fitted with two lateral inspection tubes above the bulb, one in the centre, and one below. This burner was tested under four conditions, with and without the gauze, and also with and without a mantle at the base; but, like their predecessors, the tests had to be carried out in the cold, as the glass would not bear the heat of lighted gas. The more interesting results of these tests were to show, as in the former case, that the introduction of the gauze really increased the pressure over the whole cross section of the tube at all points before the gauze, but decreased the pressure, especially in the centre of the tube, after the gauze. At the actual inlet to the gauze, the gas current was more uniformly distributed over the cross-section of the tube than when the gauze was absent.

Based upon these preliminary experiments, Dr. Wedding proceeded to investigate the conditions prevailing at different points in the tubes of actual inverted burners, measuring the pressure with and without mantles, and also both when the burner was cold and when it was hot through the ordinary process of combustion. Some of the burners were fitted with parallel tubes, and some with slightly divergent tubes—one of them being of unusual length, and provided with two conical portions arranged base to base. The general results of these tests followed very closely those which have already been described for the glass apparatus. In the first burner, with a parallel 11 mm. tube and a 19 mm. bulb containing a gauze, the effect of heating was to reduce the central pressure in the upper part of the tube below that at which it stood when the tube was cold. The two values coincided at 0·4 mm. in the position where the gauze was situated, after which the pressure in the hot tube was slightly higher than that in the cold tube until the final orifice was reached. The sudden change in direction of the curve at the spot where the gauze was fixed, characteristic of the cold burner, disappeared on heating. Two other burners of identical dimensions were tested, which differed only by the fact that one contained a parallel inner or injector tube close to the nipple. This inner tube was 7·5 mm. diameter and 30 mm. long; the tube of the burner proper being 12 mm. in diameter. The results of the measurements showed that when properly designed—*i.e.*, when it was neither too narrow nor too long, the injector tube improved the behaviour of the burner considerably, the pressures remaining higher throughout the entire tube when the injector tube was present, and being highest of all when the burner with the injector tube was hot. This burner was so well constructed that no sensible effect on the curve was to be noticed at the spot where the gauze was placed. Two other burners, which were fitted with tubes of increasing diameter and gauzes in enlargements near their outlets were also examined. These were distinguished from the other burners by being fitted with jackets extending upwards from below their enlargements to points near the injector chambers; the object of the jackets being to protect the tubes and gas from overheating. The devices answered their purpose very well; and generally the curves of pressure given by the burners were favourable. Last of all an upturned burner was examined in a similar fashion. Its investigation showed that the effect of lighting the burner was much more marked than in the case of the inverted burners—in fact, the mixture of gas and primary air escaped from the top of the upturned burner at a pressure of about 0·6 mm., which was, roughly, double that noticed in the case of inverted burners.

Conclusions.

As a result of his experiments, Dr. Wedding points out that the pressure before the nipple of the burner (usually about 40 mm.) is reduced to, roughly, one-tenth of its original value by passing through the orifices. Some further reduction occurs as the gas descends the inverted burner-tube; so that at the final outlet the pressure is only from 0·1 to 0·3 mm. of water column. In view of these serious losses and the variations in service pressure, which are extremely difficult to avoid, it can hardly be surprising that inverted incandescent gas-burners are liable to exhibit serious fluctuations in their light, and to be very prone to fire-back. The experiments show that many burners are highly sensitive to heat; an alteration of from 0·2 to 0·4 mm. in the pressure occurring as the burner gets heated. Manifestly, the greater the difference in pressure between that in the hot and that in the cold burner, the worse will it behave from the moment when it is first lighted until it arrives at its normal working temperature. Moreover, the alteration in pressure affects the injecting power of the gas, and so changes the composition of the mixture with air; hence firing-back is encouraged. Thus it becomes the duty of the burner maker to economize as carefully as he possibly can the little pressure that is left in the gas after its passage through the nipple. One method of doing this is to substitute nipples with single holes for those having five. It may be objected that a 5-hole nipple causes a more intimate mixture of gas and primary air. Dr. Wedding, however, feels convinced that the maintenance of the pressure is a more important object to strive after, for relatively high pressure means better injecting power, and therefore a larger proportion of air in the mixture. A copious introduction of primary air ensures the production of a very hot flame, which is followed by the evolution of a constant amount of light. In all cases, however, where a single-hole nipple is adopted, the gas-way must be most carefully centred and smoothly drilled, because the slightest irregularities lead to very bad results. Another method of keeping a high pressure in the burner-tube consists in the employment of a properly-designed inner or injector tube; but the profile of the latter must follow accurately the path taken by the stream of gas and primary air. The rise in temperature of a burner-tube when alight interferes considerably with its proper behaviour, especially in the case of inverted burners. The interference may be so great that in certain inferior types of inverted burner the combustion is too incomplete to warrant their employment in imperfectly ventilated rooms. On the other hand, as experience has shown, the heating of the burner-tube increases the light afforded by the burner. In consequence, Dr. Wedding holds that the proper method of designing an inverted burner is to allow it to heat the gas before the latter reaches the nipple. When this is the case, a comparatively rare gas passes through the holes, which injects air as well as a heavier, denser, cold gas. Therefore, as the mixture is richer in air the combustion is more intense, the flame is hotter, and the amount of light emitted by the burner is greater than it otherwise would be.

Retort-House Construction.

At the last meeting of the Rhenish-Westphalian Association of Gas, Electricity, and Water Engineers, held at Remagen, Herr Prenger, of Cologne, read a paper in which he discussed the alterations that have come over the design of retort-houses through the introduction of mechanical charging and discharging appliances, and more particularly through the adoption of inclined retorts. Using as the text for his discourse, diagrams of the retort-houses which have been built lately at Mariendorf and Nuremberg, where there are double benches of retorts, and the houses at Tegel, Rixdorf, and Cologne, where there is only one row of benches, he submitted to the meeting a set of considerations which he thought ought to be borne in mind in the construction of such buildings. In the first place, he considered it essential that efficient means should be taken to provide thorough ventilation in all parts of the house. In the second place, he felt it was most desirable that as much daylight as possible should be admitted; the light falling well upon the retorts themselves. In the third place, it was desirable, for hygienic reasons, that dust should be reduced to a minimum; the coal-conveyor being isolated as far as possible from the retort-house itself. The need for enclosing the coal conveyor or breaker was especially great, inasmuch as otherwise dust might fall over the whole house and upon the men when the wind lay in a certain direction. Finally, Herr Prenger urged the introduction of mechanical coal and coke conveyors wherever the size of a retort-house and the local conditions rendered it possible to employ such apparatus.

At the recent election for the Urban District Council of Tonbridge, Mr. James Donaldson, the Engineer and Secretary of the Tonbridge Gas Company, was successful in obtaining a seat.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

The Western District Section of the Scottish Junior Gas Association held their final gathering for the session in the Lansdowne Restaurant, Hope Street, Glasgow, on Saturday evening. The proceedings took the form of the holding of the annual general meeting, followed by a dinner. The PRESIDENT (Mr. W. Wilson, of Falkirk) occupied the chair.

At the general meeting, Mr. G. BRAIDWOOD (the Hon. Secretary and Treasurer) submitted the balance-sheet for the year. It showed that, including £23 6s. 3d. brought forward, the income amounted to £48 5s.; and, after meeting all the expenditure, there was a balance in hand of just about the same amount as last year.

The balance-sheet was adopted.

On the motion of the PRESIDENT, the following gentlemen were elected honorary members of the Association: Messrs. C. Fairweather (Kilmarnock), W. Ewing (Greenock), T. Wilson (Coatbridge), and J. M'Leod (Kirkintilloch).

Office-bearers for next year were elected as follows:—

President—Mr. A. H. Whitelaw, B.Sc., of Glasgow.
Vice-President—Mr. D. Currie, of Stirling.
Hon. Secretary and Treasurer—Mr. G. Braidwood, of Dawsholm, Glasgow.
Members of Council—Messrs. W. Wilson, of Falkirk (*ex officio*); R. A. Campbell, of Provan; J. Byres, of Glasgow; T. Orr, of Motherwell; John Smith, of Glasgow; P. M'Dougall, of Helensburgh; and A. Killoch, of Alloa.
Auditors—Messrs. James Smith and James Mann, of Glasgow.

Mr. P. M'DOUGALL moved that it be an instruction to the Council to consider as to the printing of the "Transactions" of the Association, and as to the establishment of a "Question-Box." His suggestion was that the Association should print the "Transactions" themselves, and not have a reprint from the Technical Press. He complained that the papers were not given in full, and sometimes what appeared to him to be the most valuable part of a paper did not appear; and that the reports were far from accurate, and the inaccuracies were repeated in the "Transactions." His proposal would cost more, but then the Council would revise the papers, and decide what they were to print; and, besides, as they all saw what appeared in the Technical Press, a reprint was not of the same value as a publication of their own would be. He thought that members would not object to pay sixpence or a shilling for a copy of the "Transactions" which would give their proceedings in a fuller form.

Mr. T. ORR moved the previous question.

Mr. J. M'LEOD seconded, and said nothing was done in connection with this matter in any way different from what was done in every technical society.

The previous question was carried by a majority so large that it was unnecessary to count the supporters of the motion.

The PRESIDENT said the matter of the "Question-Box" had been before the Council on several occasions, but they thought the time had not yet arrived for starting it. But if any member submitted a pertinent question to the Council, they would consider it, and they might have it discussed.

At the dinner, Mr. D. VASS (Airdrie) proposed "The Junior Gas Association."

The PRESIDENT, in acknowledging the toast, said he was sure the gentlemen who inaugurated the Association must feel that their efforts had been crowned with success. They were fortunate indeed in having so many able, eminent, and kindly gentlemen as honorary members. They had added to them that night. They felt very proud of their honorary members; and he took the opportunity of expressing the thanks of the ordinary members to them for the kindness they manifested from time to time at the meetings and visits. He also, on behalf of the Association, thanked the managers of public works throughout the district, who opened their doors, and showed the members everything that was to be seen. This was an age of "combines;" and he thought that the Junior Associations were a "combine" with the Senior Associations for their mutual benefit. Some of their brother Junior Associations wished that they should be recognized by the Senior Associations; but he thought they had all the recognition they needed, and in a more friendly and beneficial form to them than if it was official. He might say that he had the honour, at the Informal Meeting of Gas Managers, of replying to the toast of "Kindred Associations," which showed that they were recognized by the seniors. He also took the opportunity of thanking the Technical Press for the courtesy they had extended to them, and he voiced the appreciation of the members of the Association in the fact that the Press existed; for not only did they read their own papers, and the criticisms upon them, but they had also the papers of all the other Associations—the Senior and Junior—presented to them week by week. He considered this was a matter to be greatly thankful for.

Mr. J. NAPIER MYERS (Saltcoats) proposed "Kindred Associations;" and Mr. W. BLAIR (Helensburgh) acknowledged the toast.

Songs and readings were interspersed with the speeches; and an exceedingly pleasant evening was spent.

A COAL GAS EXPLOSION CAUSED BY A SUCTION GAS-ENGINE.

A recent issue of the "Journal für Gasbeleuchtung" contained an illustrated account, by Herr W. Leybold, of Hamburg, of a curious gas explosion which occurred in the city some time ago in the basement of a hotel containing a suction-gas plant for the generation of electric current for lighting purposes.

The basement in question was subdivided into a number of different rooms, some of which were separated from the others by a passage way. The suction gas-producer stood in one of the rooms, the motor and dynamo in another; while across the passage, without any door or other means of communication with the two former apartments, was a third room used for the storage of wine bottles, &c. This last room or cellar contained the vessel from which the gas-engine drew the air needed for combustion; a pipe leading through two walls and across the passage to the room where the motor was situated. At the time of the accident, the attendant was cleaning the engine before starting it for the day, when he heard the noise of an explosion on the other side of the passage. A good deal of damage was done to the basement and its contents; some of the walls being thrown down, and part of the restaurant floor being lifted out of place. A subsequent examination of the premises proved clearly that the gas did not fire in either of the rooms containing the items of the suction plant, but in that where the air-vessel was situated. This fact rendered the cause of the accident very obscure, inasmuch as the suction gas had no access to the cellar.

On inquiring further into the matter, it was found that, in conformity with the usual practice prevailing in Hamburg, a supply of town coal gas was led to the motor; a pair of meters being fixed in the room containing the suction gas-producer, and a pipe conveying the coal gas being carried to the engine alongside that delivering the suction gas. It appeared, furthermore, that on the day before the accident the engine had been started with coal gas until the producer was in full action, when the coal gas cock was nominally closed. Evidently, however, the cock was not shut completely, and the engine had been allowed to run unnoticed on a mixture of the two gases. When the plant was stopped at midnight, the engine accidentally came to rest with its cycle in the inlet position; so that (as tests made with this engine and others of the same type showed to be invariably the case) all ports remained open. Hence during the night and morning coal gas continuously entered the engine at a slow rate, passed into the air-inlet pipe, travelling backwards until it filled, and finally escaped from the holes under the lid of, the air vessel in the wine cellar across the passage. When next evening a waiter opened the door of the cellar, the explosive mixture of coal gas and air issued from it, and came into contact with a lighted gas-burner fixed on a wall bracket in another adjoining apartment.

Herr Leybold remarks that it is a common practice in Hamburg to fit supplies of coal gas to suction motors—partly in order that the engines may be started quickly and put under load before the producer has had time to get hot through, and partly to afford means for enriching the suction gas when the plant is not working well. Hitherto the system has given no cause for complaint; the peculiar concatenation of events which determined the present explosion having apparently never arisen before. Manifestly, to prevent a recurrence of the phenomenon, great care should always be taken that the main cock on the coal gas supply to a suction gas-engine is properly closed when the motor begins running on its own gas, or when the plant is shut down for the night.

APPLICATIONS FOR LETTERS PATENT.

6966.—MOORE, W. G., and CROMBIE, W. A. E., "Treatment of fuel, and the recovery and primary separation of the bye-products from same." March 30.

6971.—FENNELL, W., and PERRY, W. P., "Photometer." March 30.

6976.—SCOTT-SNELL, E., "Burners for consuming air gas." March 30.

7073.—COX, F. J., "Gas apparatus." March 31.

7101.—ANDREWS, J. D. F., "Conveyors." March 31.

7102.—ANDREWS, J. D. F., "Gas-generators." March 31.

7105.—JUNQUERA, B., "Gas-generators." March 31.

7116.—BILD, M., and WOLTMANN, F., "Packing ball-joints for gas-fixtures." March 31.

7157.—BOWLEY, J. W., "Incandescent gas-lamps." April 1.

7161.—WADE, A. A, "Mantles." April 1.

7181.—SOUTHEY, A. W., CLUBBE, H. H., and NORTHORPE, W., "Oil-gas generators." April 1.

7220-1.—WEBBER, J., "Inverted burner fittings." April 1.

7240.—SPARKS, H., "Intensifying and diffusing illuminants." April 2.

7251.—MILLS, W., "Acetylene generators and burners for producing high candle-power illumination." April 2.

7252.—TWIGG, A. C., and WARREN, H. C., "Gas-regulators." April 2.

7309 and 7318.—HIMMEL, G., "Controlling gas supply to lamps at a distance." April 2.

7320.—GLOVER, T., "Coin-freed meters." April 2.

7329.—GILBERT, A. T., "Intermittently illuminated gas-lights." April 2.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Coal-Crusher Accident at East Greenwich.

SIR,—Referring to the distressing accident reported in the last number of the "JOURNAL," whereby a man lost his life through falling into the hopper of a coal-crusher, I may say that some time ago, while I was in Buenos Ayres, when erecting a crusher, I anticipated such a possible event; and, in consequence, I had a strong grating made of 3 in. by ½ in. bars set on edge, spaced apart 8 or 10 inches by 1½-inch gas-tubing through which long bolts were passed, binding all the bars together. The "mesh" of the grating being about 12 in. by 10 in., there was no possibility of any workman falling down to the crusher teeth; while no serious obstacle was put in the way to prevent coal passing. The grating was in sections resting in the hopper, and easily removable.

GEORGE W. ANDERSON.

5, *Westminster Chambers, S.W.*,
April 9, 1908.

PARLIAMENTARY INTELLIGENCE.

WIDNES CORPORATION BILL.

This Bill has lately occupied the attention of the Police and Sanitary Committee. Mr. Wedderburn, K.C., for the promoters, stated that the Bill contained a number of clauses dealing with gas matters, but that there was no opposition to them. Originally the measure had in it a clause which proposed to make certain alterations with reference to the application of the profits of the gas undertaking of the Corporation. The ratepayers had, however, refused to consent to the contemplated arrangement—being apparently of opinion that it might affect the price of gas. Whether or not this decision was wise, it at least had the merit of saving the time of the Committee, inasmuch as the clause had, in consequence of the ratepayers' action, been deleted. Counsel mentioned that the charge for water in Widnes was very low, while that for gas was the lowest in the kingdom—viz., to ordinary consumers 1s. 3d., for works 1s. 1d., and for power 11d. per 1000 cubic feet. The clauses of the Bill relating to gas were then adjusted; several being altered to bring them into agreement with the model clauses.

WATH-UPON-DEARNE DISTRICT COUNCIL GAS BILL.

This Bill came before the Earl of Onslow (the Lord Chairman of Committees) last Thursday on a question connected with Standing Orders. The proposal was for an additional provision to enable a Joint Gas Board to be established for the Wath-upon-Dearne and Bolton-upon-Dearne Urban District Councils, to acquire the undertaking of the Wath-upon-Dearne Gas Company. The Examiners had necessarily reported against the additional portion of the Bill, as it was not included in the November notice; and therefore the promoters asked that the Standing Orders should be dispensed with, in order to allow of the provision being inserted in the Bill. His Lordship agreed to this course.

LEGAL INTELLIGENCE.

CHARGE AGAINST A LATE MAIDSTONE GAS OFFICIAL.

Mr. Herbert Kindler Acquitted.

At the Maidstone Borough Quarter Sessions on Saturday, Mr. Herbert Kell Kindler, who until lately occupied the position of Assistant Manager to the Maidstone Gas Company, was acquitted of the charge of obtaining £300 by false pretences from Mr. William Day, jun., under circumstances already recorded in the "JOURNAL." A full report of the Police Court proceedings appeared in our issue for March 24 (p. 777); and it was then stated that the case for the prosecution was that Mr. Kindler handed to Mr. Day (an Estate Agent and a Director of the Gas Company), in exchange for a draft for £300, a cheque which was not good security; that he had no possible chance of meeting it; and that he obtained the sum named well knowing he could not meet the cheque. The defence was that there were no false pretences; and that prosecutor did not really attach any importance to Mr. Kindler's cheque, but relied on his promise to repay on the following day the money borrowed.

CLAIM IN RESPECT OF A WATER RESERVOIR.

At the Town Hall, Leeds, a commencement was recently made before Mr. Edward Pollock, Official Referee, with the action of *Robinson v. Wharfedale Rural District Council*, which had been referred to him from the Summer Assizes of last year. It arose out of work done by the plaintiff, Mr. Henry Varley Robinson, a contractor, of Keighley, in the construction for the Council of a water reservoir situate at Menston. The plaintiff alleged that in July, 1905, the defendants wrongfully seized and converted to their own use his machinery and plant; and he claimed its return, or its value, and damages—the value being put at £990 11s. 9d., and the loss by depreciation at £167 5s. 4d., making a total of £1157 17s. 1d. The defendants stated that they took possession under an agreement of March 20, 1903, by which the plaintiff agreed to execute the works to the designs of their Engineer. They also counterclaimed for non-completion at the time specified, and further alleged that the works were in fact never completed—the reservoir not being water-tight.

Mr. E. TINDAL ATKINSON, K.C., Mr. HAROLD NEWELL, and Mr. C. E. BRACKENBURY appeared for the plaintiff; Mr. W. J. WAUGH, K.C., and Mr. J. O. ANDREWS represented the defendants.

Mr. TINDAL ATKINSON, in opening the case, said the defendants had called upon the plaintiff to do work which was quite independent of the contract, and was claimed for as extras. Any delay that occurred was due to the Engineer and not to the Contractor. The whole question was whether or not the reservoir was handed over to defendants complete. If it was not water-tight, the plaintiff alleged that he had been prevented from putting it right through the defendants taking possession.

Mr. *Henry Varley Robinson*, examined by Mr. NEWELL, said that delays had occurred through waiting for the Engineer's designs and in consequence of bad weather. The puddle used was good and properly mixed. The reservoir had not leaked. Complaints were made of unnecessary interference by the defendants' clerk of works.

In cross-examination by Mr. WAUGH, witness went into details as to secret payments alleged to have been made by him to the clerk of works.

Mr. *Darwin*, the plaintiff's representative, was examined by Mr. TINDAL ATKINSON, and produced notes and figures relating to tests made on the reservoir to show what leakage occurred at different periods.

These were the only two witnesses who had been called when the Court adjourned till after the Easter Vacation.

Action Against the Gaslight and Coke Company.

At the Bow County Court last Thursday, Judge Smyly, K.C., had before him the case of *Pearce v. The Gaslight and Coke Company*—an application, under the Workmen's Compensation Act, by Walter Pearce, a gas stoker, of Bidder Street, Canning Town. On Dec. 28, while working at the Bromley Gas-Works, Pearce met with an accident which seriously injured two of his fingers. He had attended Poplar Hospital ever since; but his half-pay was stopped on Jan. 21—the Company's medical officer being of opinion that he could do light work. The case was taken up by the Gas-Workers' Union. Dr. Wilson, of the Poplar Hospital, said the applicant had made eighteen attendances there. He was suffering from periostitis and enlargement of the fibrous tissue, which still existed. It might be three months before he would recover the complete use of his fingers. His hand might become perfect in time. Witness produced an X-ray photograph which showed the existence of the periostitis, and stated that in his opinion the applicant was still unable to work. It would be three months before he could recover the use of his fingers. Dr. Finucane said Pearce did not complain of any subjective symptoms. He was suffering from a pinch of the fingers, but certainly not from periostitis. If he had followed witness's advice, he would have had complete control of his fingers by now. It was further contended that applicant had not taken the necessary steps to get his fingers right, and that therefore the Company were not liable to continue his half-pay. It would be a real kindness to him, said Counsel, for no order to be made. His Honour, was, however, of opinion that the applicant was entitled to an award and half wages (15s. 9d.) as from Jan. 21.

A Disputed Gas Account.

At the Southport Police Court, on Monday of last week, Harry Rowlands was summoned for non-payment of £1 7s. 2½d. for gas supplied during the December quarter. The Gas Engineer (Mr. John Bond) stated that the meter was correct; and in cross-examination by the defendant, he said it had been examined by the Government Inspector six years ago, when the Corporation bought it, and again three days ago; and in each case it was declared to be correct. The meter bore the stamp of the Corporation. Defendant said he was going to contend that the meter had not got a legal stamp upon it, and that the sale of gas was void by Act of Parliament. A section of the Act was read by him, stating that the gas should be measured by a meter "supplied or approved by the undertakers." Defendant remarked that the Sales of Gas Act provided that all meters should be stamped with the Government stamp. The Chairman of the Bench (Mr. T. O. Clinning): Can you give any evidence of your own that you have been charged for gas which you have not consumed? Defendant replied that the Sales of Gas Act said, if the meter was not stamped according to the Act, the sale was void. The Law Clerk: We have had it that the meter has been stamped in accordance with it. Defendant: I say it has not. The Chairman: The Gas Committee have carried out their agreement. We make the order. Defendant: I protest most solemnly. You will neither hear me nor let me read the Act of Parliament.

The Water Engineership at Southampton.—At the meeting of the Southampton Town Council last Wednesday, the report presented by the Water Committee contained a letter addressed to the Town Clerk by the Water Engineer (Mr. W. Matthews) acknowledging the receipt of one intimating that the Council had accepted his resignation, which, as mentioned in the "JOURNAL" for the 31st ult., he tendered some weeks ago under circumstances already recorded. Mr. Matthews asked to be relieved of his duties at as early a date as possible, and not later than the end of the present month. The Committee passed a resolution that the engagement should terminate at the time suggested; and their report containing it was adopted by the Council.

MISCELLANEOUS NEWS.

MANCHESTER GASHOLDER CONTRACT.

At last Wednesday's meeting of the Manchester City Council, there was a lengthy discussion with regard to the proposal of the Gas Committee to place the contract for the projected gasholder of 10 million cubic feet capacity at the Bradford Road gas-works with Messrs. Ashmore, Benson, Pease, and Co. An amendment had been moved in Committee that the tender of Messrs. R. & J. Dempster, Limited, be accepted; but this was defeated by thirteen votes to four. Alderman Gibson, the Chairman of the Gas Committee, remarked that nobody had been more anxious than he and other members of the Committee to let the contract to a local firm; but with the large difference between the amounts of the two contracts, it was felt that this could not be done. The responsibility of deciding the question must rest with the Council.

As an amendment to the Committee's recommendation, Alderman Sir W. H. Vaudrey moved that the Council accept the tender of Messrs. R. & J. Dempster, and not that of Messrs. Ashmore, Benson, Pease, and Co. He said the reason for Messrs. Dempster's tender being higher than that of the other firm was because of the higher rates and the bigger scale of wages they had to pay. They were in a large way of business, and had done perhaps more work of this kind than any other firm in England. If the contract were entrusted to them, he believed the Corporation would be well satisfied with the job. The amendment was seconded by Mr. Billam, who contended that Manchester would get the benefit of the extra amount paid in rates and wages, and the impetus that would be given to trade. He added that the increased rates and wages paid by the Manchester firm as compared with the Stockton firm amounted to about £8000. Mr. Grime and Mr. White supported the amendment, on the ground that there was enough unemployment in Manchester without the Corporation sending such a big order out of the city.

On the other hand, Alderman Rushworth supported the action of the Committee. He said the tender accepted was the lowest sent in; and they ought not to go behind it. The firm had done good work for them before. Alderman Sir Bosdin Leech said that if it was to be understood that no firm outside Manchester was to do work for the Corporation, that should be stated in the advertisement. The result would be that the character of the work would suffer. Having advertised, they were bound to accept the lowest tender, if it was that of a substantial and capable firm. Among other members who supported the Committee, Mr. Kay mentioned that there were nine firms whose tenders were lower than that of Messrs. Dempster. In any case, the whole of the plates would have to be made at Stockton-on-Tees. Mr. Boyle said he would vote, if necessary, for a grant of £5000 for the unemployed out of the Gas Committee's profits; but he was strongly against accepting a tender at a higher price merely because it was that of a local firm. The course contemplated by the amendment was a step in the wrong direction, and was wrong from a municipal trading point of view.

Mr. Hynes asked whether it was legal for a tender to be sent back to a firm for revision, as that of Messrs. Dempster had been. Their original tender was £59,550; and they had been allowed to alter it to the present figure of £57,700. This was unfair; and he thought it was illegal. Alderman Gibson replied that he would never again agree to a contractor being allowed to revise his tender. In this case, his object had been to try and keep the work in Manchester.

On the amendment being put to the meeting, 25 voted for it and 56 against. The minutes were then confirmed.

VERTICAL RETORTS FOR BURNLEY.

The Gas Committee of the Burnley Corporation have under their consideration a report from the Chairman and Vice-Chairman, in conjunction with their Engineer (Mr. J. Petty Leather). These gentlemen were requested, more than twelve months ago, to inquire into the system of continuous carbonization by vertical retorts.

They state that they have visited the Bournemouth Gas-Works, and were "impressed with the simplicity of the arrangement for charging the retort, with the absence of smoke and dirt, and with the fact that the men working the plant were not exposed to heat and fumes as in the ordinary system of gas manufacture." Mr. Leather has also visited other installations; and he gives the results obtained, according to his inquiries—viz.: Increased yield of gas per ton of coal, thinner tar, reduction in naphthalene, and increase in ammonia produced.

The weak point evident to them in the retorts at Bournemouth was in the conveyor for taking away the coke. After describing this, the report proceeds to say that the difficulties in connection therewith have now been overcome—the water seal having been dispensed with in a new arrangement which Mr. Leather has inspected at the Poole works, and which is being adopted in the new installation at the Kensal Green works of the Gaslight and Coke Company.

The report describes the new device as consisting of "a drum for each retort, similar in principle to that which has been found to work so well in introducing the coal into the retort. Into this drum, when its mouth is uppermost, the coke falls continuously; the speed being regulated by a slowly revolving toothed roller. At suitable intervals, the drum is rotated; and the coke falls out without any loss of gas. A small quantity of water is allowed to trickle on to the coke above the roller; and the coke comes out warm, but not red hot."

The report concludes by impressing on the Committee the necessity of proceeding at once with the work of extending the manufacturing plant, and suggests the erection of an installation of 36 vertical retorts, if satisfactory terms can be agreed upon with the proprietors of the patent.

MANAGEMENT OF THE NUNEATON GAS COMPANY.

In a copy to hand of the "Nuneaton Observer" for last Friday, the following advertisement appears under "Public Notices."

> Notice is hereby given that an extraordinary general meeting of the shareholders of the Nuneaton Gas Company will be held at the Gate Hotel, Nuneaton, in the County of Warwick, on Monday, the 27th day of April, 1908, at eleven o'clock in the forenoon, in pursuance of a requisition by certain shareholders* for the purpose of considering, and, if approved, of passing, the following resolution—namely: "That this meeting of shareholders appoint a Committee who shall have full powers to investigate the affairs and accounts of the Company, and for that purpose to inspect the works and books, and employ experts for all purposes necessary, to inquire into the reason of the reduction of the dividend, and the increase in the price of gas to the consumers; to inquire into the nature of the agreement between the Directors and the Manager (Mr. George Helps), which apparently permits him to devote a large portion of his time to outside work, some of which is to the detriment of gas companies; and to report the result of their investigations to a further meeting of shareholders."
>
> By order, F. S. CLAY, Secretary.
>
> *Bridge House, Nuneaton, April 9, 1908.*

Referring to the above advertisement, the "Observer" made the following remarks:—

As will be seen from a notice appearing elsewhere in our columns, certain discontented shareholders in the Nuneaton Gas Company have requisitioned an extraordinary general meeting to consider certain very drastic proposals. Our interest in the matter, we must confess, is only that of outsiders; yet all the same, seeing that the matter is one that affects a very large number of local people, we feel justified in expressing an opinion on its probable effect. In the first place, we think the proposal is somewhat indiscreet from a business point of view, because the only effect it can have, if any, is to create a panic among the shareholders, and, as a consequence, shares may depreciate to a considerable extent. Then the proposal to employ outsiders to investigate the books and modes of business is a deliberate insult to the Board of Directors, who comprise some of the ablest business men in the district. If the shareholders who have requisitioned the meeting have done so in the hope that, as a result of such a gathering, dividends will go up again and the price of gas come down, all we can say is that their action is most likely to defeat its own object. When all is said and done, it is the shareholders who control a company, and not the Directors; and the shareholders always have their remedy at the annual meetings. The grievance of the petitioners is not a new one. It cropped up at the last annual meeting, and was then thrashed out; and the majority of the shareholders decided in favour of the Directors. The real fact of the matter is that for a number of years the Gas Company had an unprecedented spell of prosperity. With a clear field and no opposition, and facilities to obtain an illimitable and cheap supply of gas coal, the profits made exceeded all anticipations. The result was that the dividends paid were very large, and the price of shares went up in proportion. Then many investors of a speculative turn of mind, realizing that high-water mark had been reached, put their shares on the market, and they were snapped up at inflated prices. Now, when the Company has to meet opposition, to pay more for its coal, to increase its capital charges in respect of main extensions, &c., it must, of course, necessarily cut its profits down to a figure more like what the average commercial investment yields. But the aggrieved shareholders—who are probably among those who have bought their holdings at high prices, and who perhaps now realize that they have been bitten in doing so—seem to us to be crying aloud for the Company to pay profits on the value of their shares *plus* the margin between that price and the price they bought them at. At times we have had to take up an attitude antagonistic to the Gas Company; but in this matter we strongly advise the general body of the shareholders, in their own best interests, to repudiate the aspersions of the requisitionists, and to uphold their Directors, because we feel that to endanger by panic the financial standing of the Company will, in turn, also indirectly bring in its train financial inconvenience to the inhabitants of the town at large. The Directors at this point want to take up a strong attitude.

THE GAS-COAL POSITION.

As Seen from Various Points of View.

Producers and consumers of gas coal are now (said the "Pall Mall Gazette" on Friday) coming to grips over the settlement of the contracts for the twelve months commencing in July. At a meeting in London a month ago, the associated owners decided to stand out for the same rates as last year, with a stipulation for an advance of 1s. 6d. per ton, to operate in the event of the passing of the Eight-Hours' Bill. This position has been undermined by price-cutting (coalowners make a poor combination in a falling market); and a further meeting of the associated owners is being held in London to-day. Delegates have been invited from the chief districts; and we understand that their recommendation will be that a serious effort must be made to uphold last year's prices, but a substantial concession respecting the Eight-Hours' Bill stipulation is considered advisable.

The Newcastle-on-Tyne correspondent of the "Iron and Coal Trades Review," referring to Durham coals, says: The demand for gas coals remains very steady; and as second-hand supplies are at the moment very scarce, the price for the best brands remains at 11s. 3d. to 11s. 6d. per ton f.o.b. Tyne Dock. The London Gas Companies are again in the market, and are actively negotiating for their annual supplies; and

* We understand that the first signatories to the requisition for the extraordinary general meeting are: William North, Fred. North, Fred. Mills, John Drake, Geo. Cross, M. Baker, Frederick Burton, &c.—ED. J.G.L.

it is reported that the whole of these contracts may be concluded before the Easter Holidays. Prices seem to range from 10s. 6d. per ton f.o.b. up to 11s., according to quality; and it is expected that business will be concluded at about these figures. For second-class qualities of gas coals, the prompt price is 10s. 6d. to 10s. 9d., with a very good demand, and most of the collieries are reporting turns exceptionally well filled. The Yorkshire correspondent is not in such good tone on the subject of gas coal. He says that, although local requirements for gas coal are becoming less, there is more being sent away for shipment. The new contracts are still creating a good deal of interest; but, "so far as can be ascertained, the Yorkshire collieries are not faring over well." We have some recollection of Yorkshire coal owners recently harbouring big notions, probably a development from their successes last year, as to the prices they could command for gas coal.

THE PRICE OF GAS IN THE POTTERIES.

No Reduction at Longton.

The Longton Town Council discussed at some length, at a recent meeting, a report from the Gas and Electricity Committee on the subject of the price to be charged for gas, in view of the proposed federation of Potteries towns, and of the action of Stoke, Fenton, and Burslem in lowering their prices, as recorded in the "JOURNAL" last week (p 50). The Committee stated that at a special meeting held by them, the Manager (Mr. W. Langford) had reported that within the previous few days the price of gas in Stoke, Fenton, and Burslem had been materially reduced; and in view of the proviso to Clause XI., Schedule H, of the Draft Provisional Order sanctioning the federation (which provides that the price of gas in any area shall not be less than that charged on March 31, 1908, unless reduced by a two-thirds majority of the new Council), he had thought it right to call the Committee together to consider the position as regarded Longton. The Town Clerk (Mr. G. C. Kent) attended the meeting by request, and, upon a statement of the position, assured the Committee that if the facts were as set forth, the Local Government Board would make any necessary alteration in the date mentioned in the clause. The consideration of the matter was allowed to stand over.

The adoption of the report having been moved, Alderman Preece expressed regret that the Committee had not taken the opportunity of reducing the price of gas before the date named in the Draft Order, as other towns had done. Alderman Brookfield (the Chairman of the Committee) said a reduction had been arranged for. Mr. Brookhouse said he agreed with Alderman Preece, and had intended to raise the question. There was, he believed, grave doubt among members of the Committee as to the correct step to take; and since their meeting he had come to a different conclusion. He should therefore move, as an amendment, that the words "the consideration of the matter was allowed to stand over" be deleted, and the following paragraph added: "That the price of gas for illuminating and domestic purposes for the current quarter and for the future be 2s. 6d. per 1000 cubic feet, subject to an allowance by way of discount of 10 per cent. if paid within a month of the delivery of the account, and that the price of gas to slot-meter consumers be correspondingly reduced." He thought it would be unwise to allow the price of gas to remain as at present while the rest of the gas consumers throughout the Potteries were to have the advantage of a reduction to a very low rate indeed. It would be most unjust to the Longton consumers, and would probably have the effect of sending a few householders into the adjoining district of Fenton. He believed the reduction could be made, and he took this step on the ground of self-protection. He thought they could not wisely trust to the future to reduce the price of gas.

Mr. Tams having seconded the motion, Mr. Bridgwood expressed the opinion that if 2s. 6d. per 1000 cubic feet were charged there would be a big profit on the gas undertaking, but that the reduction would lower its worth in a valuation; for while they charged 3s. 8d. or 3s. 9d., it was worth half-a-million sterling. Mr. Reid said the Committee felt inclined to reduce the price to that which other towns had decided upon; but they were assured they could let the matter stand over without prejudice to their position. They had promised £3000 to the rates; and if they reduced the price, they would be indebted to this extent. The Local Government Board would know that Stoke, Fenton, and Burslem had reduced the price of gas in their districts on the last possible day; and the Board would take such a matter as this into consideration. Alderman Leak thought the amendment would need limitation, or it would apply to consumers within the area of supply outside the borough. Mr. Brookhouse agreed to the amendment being altered to apply to "consumers within the borough;" and in this form it was accepted by Alderman Brookfield. Alderman Preece said he took it, after the acceptance of the amendment by the Chairman of the Gas Committee, that the Committee would not only reduce the price of gas, but also hand over the £3000. If not, the matter required further consideration. If they did not get the £3000 promised, they would have to raise the rates at the next budget; and they would not be justified in reducing the price of gas and having to increase the rates. Alderman Kent contended that it would be a misfortune to the town to pass the amendment, as it would mean an increase of 6d. in the pound on the rates. Alderman Leak remarked that the £3000 promised to the borough fund would have to be found from somewhere; but he could not take a pessimistic view of the situation. He believed the Gas Committee could both lower the price of gas and hand over to the rates the amount named; for the gas-works, so efficiently managed and so skilfully worked, could surely do both. (Ironical laughter.) He knew it seemed a large order, and was rather staggering; but he believed it could be done. Alderman Brookfield said he wished the Council to understand that they took full responsibility if the amendment was accepted.

At this stage of the proceedings, a little "scene" was created by Mr. Brookhouse declaring, with some warmth, that the truth was not being put before the meeting. On these grounds, he said, he claimed the right to move the suspension of the Standing Orders so that the whole matter could be discussed. But the Mayor (Alderman Edwards) declined to accept the motion. Mr. Colclough asked for an undertaking from the Gas Committee to pay the £3000 if the amendment was carried, because if this could not be given it meant that the money would have to come from the rates. Were they fully assured that if they did not then reduce the price of gas they would have another opportunity? The Town Clerk said there was no doubt about it. Mr. Brookhouse thereupon demanded that the authority for this statement should be produced. The Town Clerk said he thought the request reasonable, and he would get the authority asked for. He added, with some feeling, that he did not give an assurance to the Council or to any Committee without authority. Documents having been fetched, the Town Clerk said that on the 31st of March, before the meeting of the Gas Committee was held, and as soon as the matter came under his notice, he took it upon himself to wire to the Local Government Board that, in view of the proviso to Clause XI., Schedule H, of the Draft Order, Fenton, Stoke, and Burslem were reducing the price of gas practically to cost; and as the Gas Committee were becoming anxious about their position, he had assured them that no injustice would be permitted, and that, if necessary, the proviso would be altered to meet the circumstances. He asked if he could have an assurance to satisfy them; and the following answer was received: "If facts are as stated in your telegram, the Board would make necessary alterations in date of Clause XI., Schedule H." Mr. Brookhouse said that was satisfactory, so far as he was concerned. He knew that the Town Clerk had received a communication, and he thought it should be made public. Alderman Leak suggested that the amendment should be withdrawn after this explanation; but Mr. Brookhouse said he preferred to leave the matter to the Council. On the amendment being put to the vote, only five members supported it; and it was lost by a large majority. The report of the Gas Committee, which was included in their minutes, was then adopted.

METROPOLITAN WATER BOARD.

At the Meeting of the Board on the 27th ult., the Works and Stores Committee presented a report on the question as to whether the Board or the London County Council should bear the cost of the extensions of mains, &c., necessary for the purpose of increasing the supply of water for fire-extinction. Towards the close of last year, the Board passed a resolution to the effect that the Council should be invited to join the Board in submitting the whole question to arbitration. The Council having been communicated with to this effect, the Clerk replied that they were willing to acquiesce in the proposal. This being so, it became necessary that the extensions and improvements should be put in hand. The estimated cost of the works was stated to be £6597; and while the Board offered to bear the sum of £800, as representing extensions which would have the effect of reasonably improving the ordinary supply of water, it was necessary to place before the Board an estimate of the total cost involved. The Committee recommended that, pending the decision of the arbitrator, an expenditure not exceeding £6597 should be incurred on the necessary works. This was agreed to; and the Committee were further authorized to appoint an arbitrator.

The Committee also submitted a report by the Deputy Chief Engineer (Mr. James W. Restler, M.Inst.C.E.) dealing with certain proposed improvements in the supply to the district of Mayfair. The Committee stated that at the present time the supply to the district was afforded from the Kew Bridge pumping-station, with supplementary pumping during the daytime from the Campden Hill station; but a certain part of the area in which there were many lofty buildings was supplied from the Hammersmith pumping-station and the Barrow Hill reservoir. The pumping at Campden Hill had proved to be inefficient and extravagant; and it was proposed, when the erection of the additional pumping machinery at Hammersmith and the filter-beds at Barn Elms were completed, to cease pumping at Campden Hill, and to wholly or partially abandon the reservoirs there, in which event the Board would have for disposal a site the market value of which, it was expected, would equal the total cost of the scheme now proposed. The works necessary for the carrying out of the scheme included the laying of a new 18-inch main through Hyde Park from the Marble Arch to Regent Street by way of Brook Street; a 12-inch main in Granville Place, Somerset Street, and James Street; and the connection and alteration of several existing mains, and other works, the total cost of which was estimated at £13,103. The adoption of the scheme would enable the Board to afford an adequate supply of water to all the buildings in the Mayfair area at a much reduced cost for pumping and distribution. The improved method of supply would be similar in operation to that which had been adopted in other districts with advantageous results; but it had been impossible to inaugurate such a system in the western district pending the partial completion of the filter-beds at Barn Elms and the provision of some additional pumping machinery at Hammersmith. The Committee were authorized to incur expenditure not exceeding £13,103 on the scheme.

The Committee also reported that the Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.) had submitted a comparative statement of the cost of lighting the Kempton Park pumping-station either by gas or by electricity. It appeared from it that the estimated initial outlay for the laying on of gas and the fixing of fittings of the best incandescent description would be £350, against £950 required for the provision of the necessary dynamo, driven by a 15-H.P. steam-engine, including accumulators, wiring, lamps, &c., if electricity were installed, and that the annual cost of lighting the station by gas would be approximately £352, against £377 for electricity. The Committee were therefore of opinion that it would be economical for the station to be lighted by gas. The Sunbury Gas Company had submitted an offer to carry out the installation of gas at the station, together with the provision of the necessary fittings, for £350; and the Committee expressed the opinion that it should be accepted. The Council agreed to this.

The return presented by the Committee relating to the supply of water in February showed the total average daily supply was 210,040,000

gallons; the mean supply per head per day being 30·1 gallons, compared with 31·1 gallons in February, 1907. The total quantity of water in store in impounding reservoirs at the end of the month was 7483 million gallons, against 8023 millions at the corresponding date last year. In the course of the month, 917 new supplies were laid on, and 11,522 yards of new mains laid.

Combined Supplies by Meter—Port of London Bill.

At the Meeting of the Board on Friday, the Appeal and Assessment Committee presented a long report dealing with the question of combined supplies by meter, and concluding with the following recommendation: "That, until further order, and notwithstanding any previous resolution of the Board, the supply to any house or building whereof any part is used for any trade, manufacturing, or business purpose for which water is used, be (if so desired by the consumer) afforded by measure at the rates prescribed by section 16 of the Metropolitan Water Board (Charges) Act, 1907, subject to the payment of a minimum sum calculated at 5 per cent. on the rateable value of the house or building in respect of which the supply is required." The Finance Committee stated that they had given the financial aspect of the matter careful consideration, but were not in a position to submit any figures which could be relied upon, and, further, that the matter was one of policy for the Board to decide. The recommendation was agreed to without discussion.

The Works and Stores Committee submitted a report with reference to the action taken by the Committee in connection with a deputation from the Board which waited on the Secretary to the Board of Trade on the 18th ult.; and, in view of the forthcoming legislation relating to the Port of London and the River Thames, and of the paramount interests of the Board in the Upper River, they suggested that the Board would, if desired, be prepared to undertake the control and maintenance of the Upper River. The Committee recommended that the course taken by the Committee and the deputation be approved. Mr. Barnard, M.P. (the Chairman of the Committee) moved that the following should be added to the recommendation: "And that the Board learn with much surprise and dissatisfaction of the nominal representation on the new authority for the Upper River propsoed to be given to the Board by the Bill for the improvement and better administration of the Port of London." He said he could not help thinking that the form which the Bill took suggested that great care and attention had been given to the part dealing with the Port, and that the other part, in which the Board were interested, had to a large extent been put on one side or not considered to the same degree. Their position in connection with the Upper River was one of extreme importance. They took from the River Thames about 60 per cent. of the water they supplied, and provided four-fifths of the revenue of the Upper River; while the questions of pollution and purity were of extreme importance to them. They could not expect to carry on their business with any degree of safety if they were not to be adequately represented on the new authority. The Chairman (Sir Melvill Beachcroft) seconded the motion, and observed that the question affected the whole of London, as it concerned health. A discussion followed, in the course of which the opinion was expressed that the representation offered to the Board was totally inadequate. Eventually the motion was unanimously adopted.

CARDIFF CORPORATION WATER-WORKS.

Historical Particulars.

The Water-Works Engineer to the Cardiff Corporation (Mr. C. H. Priestley, M.Inst.C.E.) has prepared an interesting description of the water-works of the city; and it has been issued in pamphlet form. He commences with the formation of the old Water Company in the year 1850, and the construction by them of a pumping-station adjoining the Ely Corn Mill. For upwards of twenty years, the supply was taken direct from the river, and a reservoir was formed at Penhill, into which the water was pumped. This water is very hard; there being 26° of hardness, against 3° in the Taff Fawr water. The Corporation now own 16 acres of land at the pumping-station and 3 acres at the Penhill reservoir. On account of the increase in the population, the Water Company in 1860 obtained an Act for the construction of a storage reservoir at Llanishen, with the right of impounding streams covering a drainage area of 2200 acres. By the same Act, they were empowered to supply Penarth; and this led to the construction of the Cogan pumping-station and the Cogan and Llandough reservoirs. Later on came the purchase of the undertaking by the Corporation in the year 1879—the price paid being £320,000; and since then has come the construction of the Llanisben reservoir, the Heath filters, and the magnificent Taff Fawr works, which in their entirety involve the construction of three great reservoirs in the Taff Fawr Valley of Breconshire, midway between Merthyr and Brecon, the northernmost reservoir being 35 miles from Cardiff. The first reservoir completed was the Cantref, in 1892; its water level being 1073 feet above Ordnance datum. Then came the second reservoir, opened in 1897, about 300 feet higher; and a third one—the Llwyn On—has not yet been constructed. In addition to these are the Rhubina reservoirs and filters, the Penylan reservoir and water-tower, the Leckwith reservoir, new filter-beds, and other works. The total length of mains laid is about 240 miles; and the average consumption is about 6 million gallons per day.

SKEGNESS WATER SUPPLY.

Additional Water from the New Works at Welton.

An interesting event occurred in connection with the water supply of Skegness on Monday last week, when water from the new works at Welton was for the first time turned into the service-tank from which the town is now supplied. The ceremony of opening the valve on the main from Welton was performed by Mr. Percy Griffith, M.Inst.C.E., F.G.S., the Engineer to the Skegness Water Company, who is responsible for the design and carrying out of the new scheme; and as the Urban District Council propose to acquire the undertaking on the completion of the new works, some representative members of that body were invited to attend the function. By the Skegness Water Act, 1905, it was provided that from and after the inauguration of the new supply a revised scale of charges should come into force, an increased revenue being more than justified by the heavy capital outlay involved by the

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 82.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 10	10	Alliance & Dublin 10 p.c.	19½—20¾*	..	4 17 7
268,324	10	,,	7	Do. 7 p.c.	13⅝—14⅝*	..	4 13 4
310,000	Stk.	Jan. 16	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
200,000	5	Oct. 30	6¼†	Bombay, Ltd.	6⅛—6¼	..	4 16 4
40,000	5	,,	6¼†	Do. New, £4 paid	4⅛—5	..	5 4 0
50,000	10	Feb. 27	14	Bourne-mouth Gas and Water Co. 10 p.c.	27—28	..	5 0 0
51,810	10	,,	7	Do. B 7 p.c.	16½—16⅝	..	4 3 7
53,200	10	,,	6	Do. Pref. 6 p.c.	14—15	..	4 0 0
380,000	Stk.	,,	12½	Brentford Consolidated	242—247	..	5 1 3
300,000	,,	,,	9⅜	Do. New	180—185	..	5 2 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	118—123	..	4 1 4
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	100—105	..	3 16 2
220,000	Stk.	Mch. 12	11½	Brighton & Hove Orig.	195—205	..	5 9 9
246,320	,,	,,	8½	Do. A. Ord. Stk.	152—157	..	5 5 1
460,000	20	Mch. 27	10	British	41⅛—42⅛	—⅛	4 15 1
104,000	Stk.	Feb. 13	6	Bromley, Ord. 5 p.c.	116—119	..	5 0 10
165,700	,,	,,	4⅜	Do. do. 3½ p.c.	86—89	..	5 1 2
500,000	10	Oct. 11	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	Mch. 12	7½	Cagliari, Ltd.	25—26	..	5 11 6
100,000	10	—	—	Cape Town & Dis., Ltd.	4—6	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.	7—9	..	5 0 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48—50	..	6 0 0
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	92—94	..	4 15 9
157,150	Stk.	Feb. 27	5	Chester 5 p.c. Ord.	105½—107½	..	4 13 0
1,493,280	Stk.	Mch. 12	5⅛	Commercial 4 p.c Stk.	104—109	+1	4 15 5
500,000	,,	,,	5	Do. 3½ p.c. do.	100—105	..	4 15 3
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	82—84	..	3 11 5
800,000	Stk.	,,	6½	Continental Union, Ltd.	115—320	..	5 8 4
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 13 7
460,170	Stk.	—	5½	Derby Con. Stk.	122—123	..	4 9 5
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
148,995	,,	Mch. 31	5	East Hull 5 p.c. Ord.	100—103	..	4 18 7
486,090	10	Jan. 30	12	European, Ltd.	23—24	..	5 0 0
354,060	10	,,	12	Do. £7 10s. paid	16½—17½	..	5 2 10
15,182,590	Stk.	Feb. 13	4⅛	Gas-light and Coke 4 p.c. Ord.	96—98	..	4 9 9
2,600,000	,,	,,	3⅜	Do. 3⅜ p.c. max.	87—90	..	3 17 9
3,799,735	,,	,,	4	Do. 4 p.c. Con. Pref.	106—109	..	3 13 5
4,193,975	,,	Dec. 13	3	Do. 3 p.c. Con. Deb.	83—85	..	3 10 7
258,740	Stk.	Mch. 12	5	Hastings & St. L. 3½ p.c.	93—97	..	5 2 0
82,500	,,	,,	6½	Do. do. 5 p.c.	112—115	..	5 13 1
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	19—20	..	5 10 0
4,940,000	Stk.	Nov. 14	8	Imperial Continental	179—181	+1	4 8 5
473,600	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.	93—95	..	3 13 8
195,242	Stk.	Mch. 12	6	Lea Bridge Ord. 5 p.c.	113—118	..	5 1 8

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Feb. 27	10	Liverpool United A	221—223	..	4 9 8
718,100	,,	,,	7	Do. B	161½—163½	..	4 5 8
306,083	,,	Dec. 30	4	Do. Deb. Stk.	106—108	..	3 14 1
152,736	Stk.	Feb. 13	7⅞	Maidstone 5 p.c.	135—141	..	5 8 2
75,000	5	Nov. 28	5	Malta & Medn., Ltd.	4¼—4½	..	5 5 3
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	99—101	..	4 9 1
541,920	20	Nov. 14	3½	Monte Video, Ltd.	10⅝—11⅝	..	6 1 9
1,775,892	Stk.	Feb. 27	4⅝	Newc'tle & G'tesh'd Con.	106—107	..	4 6 5
418,462	Stk.	Dec. 30	3⅛	Do. 3⅛ p.c. Deb.	87—83	..	3 19 7
15,000	10	Feb. 27	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13½—14½	..	4 16 7
300,000	Stk.	Nov. 28	8	Oriental, Ltd.	142—145	..	5 10 4
60,000	5	Mch. 27	7	Ottoman, Ltd.	6—6½	..	5 7 8
398,490	5	Oct. 30	7	Primitiva Ord.	6½—7	..	5 0 0
796,980	5	Jan. 30	5	Do. 5 p.c. Pref.	4⅜—5¼	..	4 17 7
488,900	100	Dec. 2	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
1,000,000	10	Oct. 11	8	River Plate Ord.	13½—14	..	5 14 4
312,650	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	94—95	..	4 4 3
250,000	10	Apl. 10	8	San Paulo, Ltd.	13¼—13⅜*	..	5 16 5
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	50—52	+1	4 16 2
135,000	Stk.	Mch. 12	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	244—246	..	4 1 4
523,500	,,	,,	10	Do. C	244—246	..	4 1 4
70,000	10	Nov. 14	10	South African	14⅜—15⅜	..	6 9 0
6,429,895	Stk.	Feb. 13	5⅜	South Met., 4 p.c. Ord.	121—123	..	4 6 8
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	83—85	..	3 10 7
209,820	Stk.	Mch. 12	8	South Shields Con. Stk.	154—156	..	5 2 7
605,000	Stk.	Feb. 27	5⅜	S'th Suburb'n Ord. 5 p.c.	110—119	..	4 9 7
60,000	,,	,,	5	Do. 5 p.c. Pref.	118—121	..	4 2 8
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	120—125	..	4 0 0
502,310	Stk.	Nov. 14	5	Southampton Ord.	107—112	..	4 9 3
120,000	Stk.	Feb. 27	6⅜	Tottenham A 5 p.c. and B 3½ p.c.	120—125	..	5 8 0
398,940	,,	,,	5⅛		101—104	..	5 1 0
149,470	,,	Dec. 13	4	Edmonton 4 p.c. Deb.	99—102	..	3 18 5
182,380	10	Dec. 30	8	Tuscan, Ltd.	10¼—10⅞	..	7 8 10
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	98—100	..	5 0 0
193,742	Stk.	Feb. 27	5	Tynemouth 5 p.c. max.	105—107	..	4 13 6
255,636	Stk.	Feb. 13	6½	Wandsworth B 3½ p.c. and 3 p.c. Deb. Stk. Putney	128—133	..	4 17 9
80,075	,,	Dec. 30	3		73—78	..	3 16 11
845,872	,,	Feb. 27	5⅛	West Ham 5 p.c. Ord.	99—102	—2	5 0 6
185,000	,,	,,	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
228,300	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.	102—107	..	3 14 9

† Next dividend will be at this rate. Prices marked * are "Ex div."

new scheme, which is now approaching completion. It was also required by the Act that, after the new supply was once available, the water from the old works, which was very highly charged with saline constituents, should no longer be used for the supply of the town. Although the pumping-station is only partially finished, sufficient of the machinery is available to secure a constant supply of water from the new source; and consequently the ceremony marked an important era in the history of Skegness. The Welton water had a somewhat turbid appearance on being first turned on, but this defect will be quickly remedied, it is confidently expected, now that a constant flow has been inaugurated.

The new scheme, which has been carried out by the Right Hon. the Earl of Scarborough, comprises a well and boring situated at Welton (a village seven miles north-west of the town), a service reservoir one mile beyond the pumping-station, and a supply-main connecting the new works with the service-tank at the old ones. The pumping machinery consists of a duplicate installation of suction-gas plant, gas-engines, and three-throw pumps, each of a capacity of 20,000 gallons per hour. The buildings housing the machinery are of picturesque design, harmonizing well with the rural nature of the surroundings. The service reservoir, situated on a hill at an elevation of 200 feet above Ordnance datum, has a capacity of 400,000 gallons, and is subdivided into two compartments to facilitate cleaning. The main is 10 inches in diameter throughout, and is provided with the necessary sluice-valves, air-valves, and wash-outs. A Venturi meter is fixed at the Skegness end of the main in such a position as to furnish a constant record of the consumption of water during the 24 hours and also throughout the year. This will be of the utmost value in revealing waste, and will also be specially useful in showing the exact variations in the demand and the summer maximum.

It has been a matter of peculiar difficulty to ascertain the actual consumption in the height of the Skegness season, and particularly on the August Bank Holiday, when the town usually contains from twice to two-and-a half-times its normal or residential population; and the necessity for providing a water supply equal to such an excessive maximum demand has involved the construction of works with a capacity far larger than would otherwise have been needed. This feature of the case is well illustrated by comparing the capital cost of the new works with the normal population. The total outlay, which, owing to favourable tenders, proved to be much less than was originally estimated, has amounted to about £24,000; and, on a normal population of 4000, this represents a ratio of £6 per head, due entirely to the extreme variation between the summer and the normal demand.

In connection with the contemplated purchase of the undertaking by the District Council, it is interesting to note that, owing to the operation of the sinking fund, the immediate effect of the transfer will be a considerable increase in the charges on the rates (estimated at 9d. in the pound); and it is a serious question for the ratepayers as to what period will elapse before the undertaking so develops as to be self-supporting, apart from a general rate-in-aid.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At the meeting of the Dundee Town Council on Thursday, Mr. Burke moved that the matter of coal contracts for the gas-works be remitted back, with powers, to the Gas Committee, pending the appointment of a General Committee for coal buying for the various departments. He had, he said, gone into the analyses of the coal supplied during the nine months to the end of January, and, comparing the analyses upon which the coal was purchased with the actual results, he found that the loss in yield of gas was 312 cubic feet per ton. Last year, 49,000 tons of coal were purchased for the Gas Department; and on this basis the deficiency in nine months was 15,288,000 cubic feet of gas, which, at 2s. 6d. per 1000 cubic feet, represented a sum of £2000. For a year, the loss would be £2700. This motion was not seconded. Mr. Burke then moved that it be remitted to the Gas Committee, without powers, to advertise for coal, pending the appointment of a General Committee. Mr. G. Stevenson, the Convener of the Gas Committee, moved that tenders for coal be remitted to a Sub-Committee of four members of the Council, to open and tabulate the tenders, and report to the Gas Committee. Mr. Soutar moved that tenders for coal be advertised for, and be submitted to a meeting of the whole Gas Committee. Mr. Soutar's motion became the finding of the Council by a large majority.

Reverting to the rejection by the ratepayers of Selkirk of the gas transfer which the Town Council had arranged, my attention has been called to the publication last week in the "Southern Reporter," the Selkirk newspaper which supported the transfer, of a letter to the Editor by Mr. Arthur Silverthorne, Assoc.M.Inst.C.E., of London, to the following effect: "Perusing a record in your columns of the preliminaries that preceded the taking of the poll, I should say that no such error of judgment has been shown by a community for at least the last twenty-five years. Approximately there have been 155 municipal gas transfers confirmed by ratepayers, including 32 Scotch transfers, within that period. They have all been attended by a great measure of success, except one, in which my advice was disregarded. . . . I am strongly of opinion that the ratepayers at Selkirk would have confirmed the purchase by a large majority if they had not in the origin been confused by such a valuation as £10,087. There is no precedent for a non-statutory undertaking with a sale of 31 million cubic feet being sold on such terms. There was, however, a condition under which the offer might have been orthodox—namely, if the Company had been working under statutory powers with a mere nominal capital and a 10 per cent. dividend. There are a few instances of purchases of that kind—notably Edinburgh and Bradford. Practically those undertakings were obtained for a mere song, and not in relation to their value at all. But the Companies could not prevent this, having in the origin confined capital to mere nominal figures, statutorily restricted to

PAST.

Boy (leg):—"They began here in 1891, with only Ten Men, and have spread **ALL OVER THE WORLD** since we were born."

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

the dividends prescribed by the Gas-Works Clauses Acts. They paid for all accruing extensions out of revenue. It is simple enough. All 'statutory' undertakings must be valued on dividends. Although the Selkirk Company's claim for compensation was based on a price per stock, and this has been the case in many Scotch transfers, the method is not orthodox; and the real measure of compensation can only be calculated on 'maintainable profits' capitalized, less the necessary deductions for deficient plant. It is probable that the amount claimed just fitted those conditions, taking into consideration all that has been stated. It required, however, confirmation. Scotchmen are proverbially cautious in their dealings. They would not in this instance have discarded a safe deal had it been made clear to them that it was absolutely safe. A word of advice in time to the Selkirk ratepayers: Let the Council retrace their steps, begin *de novo* with the Burghs Gas Supply Act and 'explicit valuations,' and avert the disaster which awaits them when too late they discover themselves next November confronted by statutory parliamentary notices for an Act and incorporation on the Company's part. The ratepayers' poll has justified the Company in taking such a step; and directly they do, some shrewd warnings expressed publicly some time ago by your Provost will most unquestionably be verified to the very letter." The letter is signed "A Municipal Economist;" but the Editor says, in a footnote, that he has obtained permission to state that the writer of it is Mr. Silverthorne. With deference to Mr. Silverthorne, I think that the "confusing" element which turned the scale against the transfer was not Mr. Herring's valuation of £10,087 so much as the statement by Mr. Muir, who was the leader of the opposition, that the Chairman and leaders of the Gas Company were prepared to negotiate for a restriction of the dividend paid by the Company. The statement has never yet been contradicted by anyone on behalf of the Company; and, consequently, it may be assumed that some such statement was made, though most probably not intended for publication. But such a statement would not necessarily mean that the Company were prepared to restrict their dividend upon the old terms. By no means. The natural inference would be that they would restrict it upon an increased capital, in which event the community might have to contribute even more to the divisible profits than they have been doing under a dividend restricted upon the small capital to 10 per cent. I wondered, during the controversy, that the promoters of the transfer did not observe this point, and bring it home. In my opinion, it was mainly on account of their failure to do this that the transfer was rejected.

In accordance with a rule adopted some time ago, the Scottish Junior Gas Association—Western District—held their annual general meeting to-night. The meeting was almost altogether formal, and requires, in that portion of it, no further notice. The part which was not formal consisted of a motion by Mr. P. M'Dougall, of Helensburgh, with reference to the printing of the "Transactions" of the Association, which he wishes should be done more fully than is obtained in a reprint from the Technical Press. Mr. M'Dougall has also a grievance with regard to the quality of the work done in the Technical Press, upon which part of his subject he made some remarks which were the reverse of complimentary; but as they were not homologated by the meeting—an overwhelming majority rejecting Mr. M'Dougall's proposal—what he said need not be canvassed. After the annual meeting, an excellent dinner was served, and several hours of a very enjoyable nature were spent. The Junior Association is now in vacation. As to the Western District, I can only repeat, in substance, what I wrote last week regarding the Eastern District—that the work done by them has been excellent, and exceedingly creditable to all who took part in it.

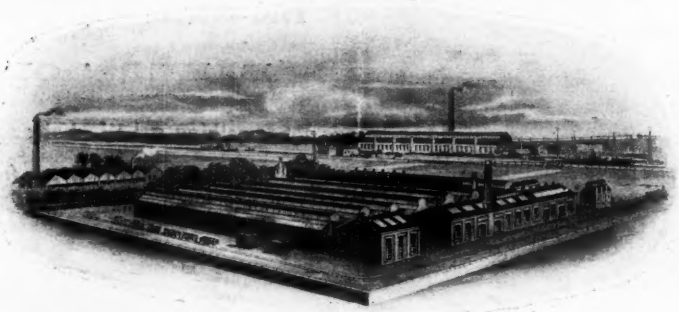
In the Biggar Town Council this week, Bailie Plenderleith, on behalf of a Special Inquiry Committee, read a report regarding the question of the present supply of gas in the burgh, both as regards quality and price. In the report it was stated that the Gas Company purpose executing very extensive repairs without delay, with the object of being able to supply gas at a cheaper rate, and so make it more available for cooking purposes. The Committee, in consideration of the proposal of the Company, were not prepared to advise the Council to take any steps towards purchasing the gas-works. The Council adopted the report, and instructed the Town Clerk to write to the Company informing them of their resolution.

The Sanquhar Town Council on Monday considered a report by Mr. J. Hepworth, of Edinburgh, relative to the condition of the plant in the gas-works. Mr. Hepworth stated that when the new gasholder was completed there would be adequate storage capacity for a number of years. In order to complete the works, he recommended the erection of a gas-engine and exhauster, a set of purifiers, a station governor, 6-inch piping throughout, and the necessary gauges. If they carried out these recommendations, they would be in a position to manufacture gas economically. The report was adopted; and an offer by Messrs. Firth Blakeley, Sons, and Co., Limited, of Dewsbury, to supply a second-hand set of purifiers for £144, was accepted. The estimated cost of the new plant is £340. It was reported that since new retorts had been put in, the yield of gas per ton of coal had increased from 6000 to 8000 cubic feet.

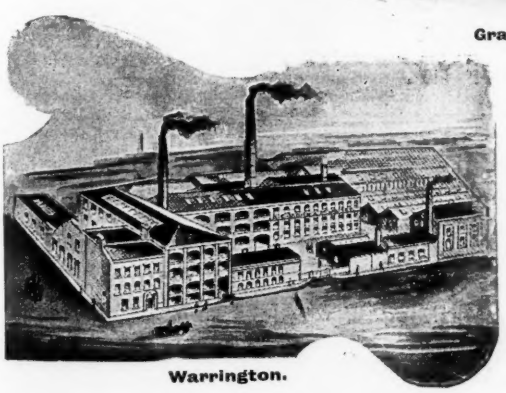
A special meeting of the Laurencekirk Gaslight Company was held on Wednesday, for the purpose of considering a resolution to the effect that the Company be registered as a society with liability limited by shares, under the Industrial and Friendly Societies Act, 1893, with the name of "The Laurencekirk Lighting Society, Limited," subject to rules unanimously adopted by the Directors; and that the Directors should be empowered to take all steps necessary and proper to carry the resolution into effect. The Chairman—Mr. John Steel—moved the resolution; and it was adopted.

It is reported that at a private meeting of the Edinburgh and District Water Trust on Thursday, the Law Agent gave in a report regarding the litigations between the Trust and the Clippens Oil Company, Limited, regarding the workings at Pentland. It is understood that the total cost to the Trust, including the award to the Company by the Law Courts of £27,000 as damages for loss sustained by stoppage of workings, amounts to over £67,000. The claim of the Clippens Company for loss amounted to £137,000.

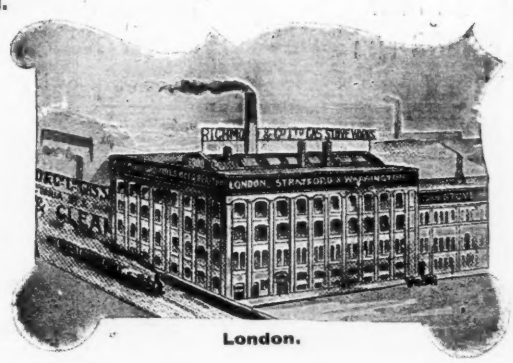
PRESENT.



Grappenhall.



Warrington.



London.

Richmond's Works in 1908, One Thousand Employed.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington, &c.

Last week several inquiries were held in Edinburgh under the Private Legislation (Scotland) Procedure Act of 1899. Two of the measures promoted related to water supplies—one to St. Andrews and the other to Troon. With reference to the St. Andrews case, Counsel explained that the present water supply was deficient in quality and quantity, and was particularly short in the summer months, when the population was largely increased by the influx of visitors. For some years the Local Government Board had been pressing the Corporation to get an improved supply. The scheme which was being promoted was accepted as most likely to give what was wanted; and the Local Government Board approved of it. The scheme consisted in tapping the Dunino and Kinaldy Burns, from which 550,000 gallons of water per day would be obtained—an increase upon the present supply of 250,000 gallons; and leaving 250,000 gallons for further development. There was opposition to the scheme from the burghs of Kilrenny, Pittenweem, and Anstruther. In the course of hearing evidence for the objectors, the Parliamentary Commissioners stopped the case, and stated that, on its merits, the Order should not further proceed. In their opinion, it was most desirable that a water supply for St. Andrews and all the East of Fife should be provided for in a really comprehensive water supply scheme. They considered that the appropriation of the source of supply in this area, owing to the low rainfall, could not be safely left to competition, and that a scheme for the common good of the whole population, resulting through further public inquiry or conference or co-operation between the local authorities concerned, would be of the utmost possible advantage.

The Order relating to Troon proposed the taking of water from Loch Bradon, on the estate of the Marquis of Ailsa, for augmentation of the present water supply, and for the supply of the neighbouring burgh of Prestwick. It was explained that the promoters were willing to give a supply of 250,000 gallons of water per day to Prestwick, on terms to be arranged or fixed by arbitration. For the burgh of Prestwick, it was maintained that there should be a Joint Board for the management of the water supply. The Commissioners passed the Order, subject to the insertion of a clause giving to Prestwick the right to a supply of water at cost price—the price to be determined by an independent arbiter to be agreed on between the parties, or failing agreement before the Secretary for Scotland.

Appointment of a Gas Manageress in Ireland.—The following report from Kilkenny appeared in last Thursday's issue of the "Freeman's Journal:" A unique distinction in the history of gas has been conferred on Miss Ina G. Richmond (sister of Mr. John Richmond, the Manager of the Kilkenny Gas-Works), by her appointment as Manageress of the Magherfelt (Co. Kilkenny) Gas-Works. In the whole history of gas manufacture, this is the first occasion on which a lady has been appointed to such a responsible position. On Wednesday night, at her brother's residence, the employees of the Kilkenny Gas-Works presented her with a costly electro-plated tea service.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 11.

Sulphate of Ammonia.

Activity in the market has continued throughout the week, and at the close it has resulted in a further advance in values. Home demand has been stimulated by more seasonable weather, and this, added to export requirements, has kept producers bare of stocks, production being now a diminishing quantity. The closing quotations are £12 7s. 6d. per ton f.o.b. Hull, £12 10s. per ton f.o b. Liverpool, and £12 12s. 6d. per ton f.o.b. Leith. Spot prices have also been paid for May; but for later delivery buyers still remain obdurate, believing that with the cessation of spring demand available supplies will become more abundant. Makers, on their part, have advanced their ideas, influenced by the firm spot market, and £12 7s. 6d. per ton is now being quoted for July-December delivery, f.o.b. the best ports.

Nitrate of Soda.

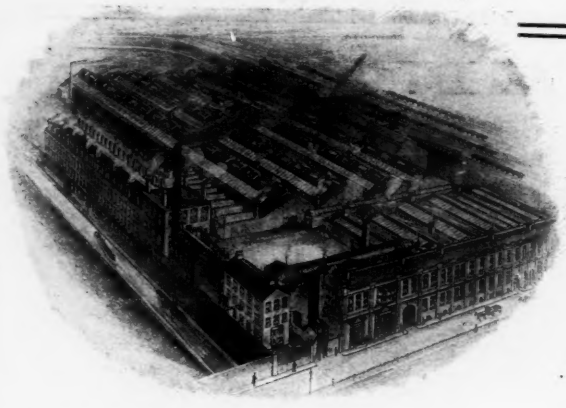
There is more doing in this market; and spot prices remain 10s. 9d, and 10s. 10½d. per cwt. for 95 per cent. and refined qualities respectively.

LONDON, *April* 13.

Tar Products.

There is little alteration in any of the markets; and, seeing that the majority of the works will be closed for about a week at Easter, no great revival in business can be looked for during the present month. Pitch remains in about the same position. The majority of the manufacturers have cleared out whatever quantity they were compelled to sell during the present season, though sales continue to be made at about the existing figures. With regard to next season, continental consumers refuse to offer more than to-day's prompt prices for September-December delivery; and as dealers are not willing to come on at these figures, business is impossible. Creosote is quiet, and business is reported to have been done in London for prompt delivery at 2⅜d.; while in the North, 2½d. has been freely taken for prompt clearance. Benzols are quiet. There are sellers in the North at 7⅜d., casks included, f.o.b.; and although the London manufacturers refuse to quote under 8⅜d., it is possible they would give consideration to a firm offer of 8¼d. Benzol 50-90 per cent. and toluol are both quiet and difficult to sell. Solvent naphtha is unaltered. It is possible to buy in London at 10d. per gallon for delivery to the end of the year; but consumers do not appear willing to pay this figure. High-flash naphtha is quiet, and difficult of sale. Carbolic acid is unchanged. Crude 60's, it is stated, have been sold in London at 1s. 6¾d.; but 1s. 6d. per gallon is said to have been paid, *ex* makers' works, in the North. There are no sales reported in anthracene. Refined naphthalene is unchanged in price; but salts are quiet, and difficult of sale.

The average values during the week were: Tar, 12s. to 16s. *ex* works. Pitch, London, 20s. to 20s. 6d.; east coast, 19s. to 20s.; west coast, 19s. to 20s. f.a.s. Benzol, 90 per cent., casks included, London 8½d. to 8⅝d., North 7¾d. to 8d.; 50-90 per cent., casks



The NEW GAS-HEATED
BAKERS' OVEN
is not something a little better than others—
it is something quite different from all others.

MORE NEW THINGS FROM ESSEX WORKS.

Hitherto Gas has not been much used in Bakery and Confectionery work owing to the cost.

The *"Victor"* is so effective and so cheap to run that it is going to set the ball a-rolling in dead earnest and make

Gas as popular in Bakeries as it has long been in domestic Kitchens.

The "VICTOR."

JOHN WRIGHT & CO., BIRMINGHAM.

See what an Expert says of the "VICTOR" in No. 4 Advt.

included, London 8¼d. to 8½d., North ⅜d. less. Toluol, casks included, London 9d. to 9½d.; North, 8¼d. to 8½d. Crude naphtha, in bulk, London 3⅜d. to 3⅝d., North 3d. to 3¼d.; solvent naphtha, casks included, London 9⅜d. to 10d., North 8⅞d. to 9d.; heavy naphtha, casks included, London 10½d. to 11d., North 9½d. to 10d. Creosote, in bulk, London 2⅜d.; North, 2⅛d. to 2¼d. Heavy oils, in bulk, 2⅜d. Carbolic acid, 60 per cent., casks included, east coast 1s. 6½d. to 1s. 7d.; west coast, 1s. 6d. to 1s. 6½d. Naphthalene, £4 10s. to £8 10s.; salts, 35s., packages included and f.o.b. Anthracene, "A" quality, 1¼d. to 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market is still exceedingly firm for prompt delivery. In London, the principal Gas Companies have sold at £12 10s. on their special terms; while the ordinary makes have been sold at £12 5s. to £12 7s. 6d. on Beckton terms. In Hull, £12 7s. 6d. has been paid for prompt delivery; while in Liverpool business has been done at £12 10s. In Leith, £12 11s. 3d. has been paid, and £12 12s. 6d. is now asked.

COAL TRADE REPORTS.

Lancashire Coal Trade.

With the exception of a modification in the requirements of engineers and foundry proprietors for engine fuel, the coal trade of the county continues very firm. Even house coal, contrary to expectation, and notwithstanding its high price, remains a notable feature in the week's demand. Shipping coal is still going down to the tips in large quantities. Inquiries for gas coal and cannel are increasing. Contracts, so it is reported, are being concluded on the same terms as last year, with the proviso that another 1s. 6d. per ton will be added the moment the Eight Hours (Mines) Bill becomes law. If it does not pass, colliery proprietors state that no further increase will be required. The Manchester Chamber of Commerce has passed a resolution condemnatory of the Bill, and Sir Lees Knowles, a large local colliery proprietor, says the measure will be absolutely unworkable. Coke is quiet. There is no alteration in prices. The shipping coal from this centre is sent chiefly to the Isle of Man, Ireland, and to western English ports.

Northern Coal Trade.

There has been a strong demand for coal, and that for nearly all kinds, with prices generally very firm. In the steam coal trade, the heavy exports have stiffened the prices; and best Northumbrian steams are quoted from 13s. 3d. to 13s. 6d. per ton f.o.b., with second-class steams at 11s. 6d. to 12s., and steam smalls from 7s. to 7s. 6d. The output at the collieries continues very heavy, and is generally well taken up, especially the best classes. In the gas coal trade, the demand is full for this season; the usual falling off in the home inquiry being well made up by the very large exports. Durham gas coals vary in quotation from about 10s. 6d. to 11s. 3d. per ton f.o.b. for the usual kinds, according to quality, while "special" sorts are quoted at about 12s. As to contracts, it may be said that the heavy ones for the Metropolitan Companies are now in course of arrangement; and the general supposition is that the price that is settled on ultimately will be somewhere near 10s. 3d. to 10s. 9d. per ton f.o.b., according to the quality. It is, however, probable that a week or so must pass before reliable news is available as to the average prices that are likely to be paid. For one lot, it is reported that about 12s. 10½d., delivered in the Thames, has been accepted; but as has been hinted, some of the figures are problematical. In coke, the market is steady; and gas coke is now quoted from 14s. to 14s. 9d. per ton f.o.b.

Scotch Coal Trade.

There is a little more activity in the market, due, it is understood, to the anticipated early opening of the Baltic trade. The improvement in the North of England market has had the effect of sending orders to Scotland, and stiffening prices there, particularly for ell. Splint is reported to be in poor demand. Other sorts are very plentiful. The prices quoted are: Ell 10s. 6d. to 12s. per ton f.o.b. Glasgow, splint 11s. to 11s. 3d., and steam 10s. 6d. to 10s. 9d. The shipments for the week amounted to 260,005 tons—an increase of 11,743 tons upon the previous week, but a decrease of 43,422 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,010,640 tons—a decrease of 442,222 tons upon the corresponding period of 1907.

The Newcastle Correspondent of the "Glasgow Herald" telegraphed at the close of last week as follows: "Although the bulk of the London Gas Companies' contracts yet remain to be settled, it is understood that the first purchases have just been negotiated. These, in the case of the South Metropolitan Company, include 150,000 tons of special Durhams at 14s. per ton c.i.f. Thames, Sunderland shipments. In the case of the Gaslight and Coke Company, it is understood that 100,000 tons of South Durhams have been closed for at 12s. 9d. per ton c.i.f. Thames, Hartlepool shipments. In the former contract, the colliery will carry the coals in their own boats."

Warrenpoint Gas-Works Purchase.—At a meeting last week of the Warrenpoint Urban District Council, the Clerk reported that he had written to the Secretary of the Gas Company (Mr. W. Johnson), stating that at a special meeting the Council had decided to offer £2000 for the gas-works, and asking him to bring the matter before the Directors. He received a reply stating that the Directors could not take less than £2250. He then summoned the Committee appointed by the Council; and they interviewed the Directors, and now reported that, after much discussion, a compromise had been arrived at fixing the price at £2125, which sum the Committee consented to submit to the Council for approval. The Council agreed to these terms; and it was decided to apply to the Local Government Board for a loan.

SEASON 1908.

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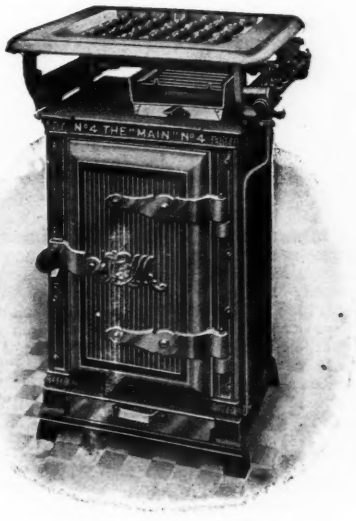

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BIRMINGHAM, BRISTOL, MANCHESTER, MELBOURNE, AND SYDNEY.

Acknowledging Mr. Haddock's Services at Warrington.

The minutes of the Gas Committee submitted at the meeting of the Warrington Town Council last Tuesday contained recommendations that the salary of the Gas Engineer (Mr. W. S. Haddock) be increased from £500 to £600, and that of the Assistant Gas Engineer (Mr. J. M'Nicholl) from £150 to £175 per annum. In moving the adoption of the minutes, Alderman Pierpoint referred to the splendid results of the gas undertaking, and said these were in a great measure brought about by the careful management of Mr. Haddock. During ten years, the sum handed over by the Gas Committee for the relief of the rates amounted to £63,200. It had been proposed to hand over this year £10,000, and a further sum of £1500 taken out of the reserve fund, in order to relieve the rates. They had not only realized this enormous amount of money, but had also cheapened the price of gas to the consumer. His remarks applied equally to the Assistant Gas Engineer. Mr. Lord moved that the recommendations be referred back, as the time was inopportune for raising salaries, in view of the proposed increase in the rates. The recommendations were, however, approved.

Godalming Water Supply.—Experts are differing as to the quality of the water supplied to Godalming. Dr. Rideal says that on analyzing two samples he found that the water was very inferior, and unsuitable for a public supply. Sir Thomas Stevenson, on the other hand, after sampling water sent him by the Godalming Corporation, declares that he found it fair, both chemically and bacteriologically. The Corporation are in communication with Dr. Rideal on the matter.

Earby and Thornton Gas Provisional Order.—Opposition was offered by the Skipton Rural District Council to the application of the Earby and Thornton Gas Company to the Board of Trade for a Provisional Order authorizing an increase in the share capital and a sliding-scale of charges; and the parties recently attended before the Board, when their cases were argued. The Board have now intimated to the Council that they have decided to grant the Company's request for an Order, subject to certain modifications. These are: The additional share capital to be authorized will be £10,500, with borrowing powers not exceeding one-third of this amount. The standard price of gas will be such as to provide that there shall be no increase of the authorized rates of dividend until the selling price is below 3s. 9d. per 1000 cubic feet, and no compulsory reduction of dividend unless the selling price exceeds 4s. per 1000 cubic feet. The Board do not propose to insert the suggested clause as to the sale of the undertaking to the Local Authority.

An Unappreciated Circular at Loughborough.—As the result of a long discussion, the Loughborough Town Council have unanimously decided upon the withdrawal of a circular issued by the Gas Committee to which exception has been taken, and the substitution for it of one in modified terms. The offending circular was issued to consumers in arrear, and threatened legal proceedings, and the cutting off of the gas if the account was not paid in 28 days. The question was introduced at the previous meeting of the Council; and the matter was then adjourned for further consideration. The Gas Committee, however, decided to adhere to their action in issuing the circular; and when the Council met again last week, Mr. Cartwright once more moved that it be discontinued. In defence of the Committee, Alderman Bumpus pointed out that the amounts owing at the end of a quarter had been as much as £1700 or £1800. Consumers were given a month to pay after the call of the collector; and at the expiration of this, 48 hours' notice was given to sever the supply. Mr. Cartwright suggested that the former custom of allowing discounts should be adopted, while Mr. Coltman considered it was no insult to ask any member of society to discharge his debt.

Consolidated Water-Works Company of Rosario.—The report of the Directors for the past year (1907) shows that the gross revenue, after making due provision for bad and doubtful debts, amounted to £70,261 and the working expenses to £28,752; leaving £41,509. After deducting debenture interest and other charges and the interim dividends paid on the ordinary shares (3 per cent., tax free), and a like dividend on the preference shares, and placing £3290 to the reserve for the redemption of capital and £5000 to the general reserve and contingency fund, there remains £15,271. The Directors recommend a dividend of 4 per cent. on the ordinary shares, tax free (making 7 per cent. for the year); leaving a balance of £5071 to be carried forward to the ordinary share dividend account. The consumption of water increased rapidly during the year, owing to the augmentation in the number of consumers. It has thus been necessary to give constant attention to the enlargement of the works, in order to keep pace with the requirements of the city; and considerable additions to the settling and storage reservoir capacity are contemplated. The outlay involved has already been large, and the capital account is overdrawn. To provide for this, a further issue of capital will have to be made.

Magnitude of the London Water Supply.—The report of the Metropolitan Water Board for the year ending March 31, 1907, which was noticed in the "JOURNAL" on its issue by the Board some months ago, has just been published as a Blue-Book, under the provisions of the Metropolis Water Act, 1902. Referring to it a few days since, the "Westminster Gazette" said: "In the array of staggering figures given in the annual report of the Metropolitan Water Board for the year ending March 31, 1907, the most impressive are those which express London's yearly consumption of water. In twelve months, this amounted to the stupendous total of 82,125,249,347 gallons, representing a daily average supply per head of a little under 33 gallons (nearly 3 cwt. of water), or considerably over 50 gallons a year for every man, woman, and child living on the entire earth to-day. It is impossible for the unaided mind to realize what the year's supply of 82,125 million gallons really means. It helps us a little to say that this quantity of water would fill a reservoir a mile square to a depth so great that, if St. Paul's Cathedral were dropped into it, the top of the cross would be more than 100 feet below the surface of the reservoir. The area of this Metropolitan lake would be little less than that of the City of London itself."

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Electric Light Failure at Southsea.—Owing to a fault in a cable through the penetration of the insulating material by water, a failure of the electric light occurred last Friday in the Albert Road district, Southsea. All consumers in the vicinity were inconvenienced.

Fatal Acetylene Explosion.—While an acetylene generator was being repaired last Tuesday morning at the Ullcoats iron-ore mine in West Cumberland, an explosion occurred, killing one man and more or less seriously injuring four others. The men only resumed work at the mine the previous day, after a strike lasting sixteen weeks.

Bognor Public Lighting.—The Bognor Urban District Council have been furnished with a report from their Lighting Committee, showing that the gas lighting of the town costs less than it did six years ago, though there has been an increase in the number of lamps. Out of 78 towns of similar size, Bognor is now the lowest but one in respect of the charge for public lighting. The present annual cost is £592 for 304 lamps, compared with £691 for 233 lamps in 1902.

Lighting of Peak District Towns with Gas.—A good many of the towns and villages in Derbyshire are still without gas, notably in what is known as the Peak district. By next winter, however, at least three places much favoured by tourists—Castleton, Hope, and Bradwell—will have gas, by an extension of the mains from the new works at Hathersage. Some idea of the cost may be gathered when it is stated that the distance from Hathersage to Castleton is fully six miles. The charge is to be 3s. 4d. per 1000 cubic feet, compared with 5s. 6d. at Chapel-en-le-Frith and 5s. at Tideswell and Whaley Bridge.

Progress at the Devonport Gas-Works.—Alderman Hornbrook, the Chairman of the Gas Committee of the Devonport Corporation, informed the Town Council last Thursday that, notwithstanding the diminution in the use of gas in the Dockyard, where electricity has been installed for power and lighting purposes, the output of gas continues to increase. In reply to a question, he added the information that of the automatic meters installed only about 1 per cent. were idle owing to houses being void. This could not be prevented, as it would not be prudent to take out installations every time tenants moved.

Fire at the Rochdale Gas-Works.—About half-past two last Wednesday morning, there was an alarming outbreak of fire at the gas-works of the Rochdale Corporation. It appears that a "boil-over" occurred in one of the tar-stills. The tar immediately became ignited, and there was a fierce blaze. The alarm was given at the fire station, and a steamer and tender proceeded to the gas-works. Under the direction of the Chief Constable, the fire was at once attacked, and after two hours' work in the dark it was got under control, and was confined to the tar-still. The damage was only small—amounting to between £20 and £30.

Strike of Stokers at Rio de Janeiro.—According to a telegram received through Reuter's Agency, the men employed at the gas-works at Rio de Janeiro have gone on strike, and the city was plunged in darkness last Friday night. It appears that the Rio de Janeiro Tramway, Light, and Power Company, Limited, have received a cablegram to the effect that the strike is confined to the stokers solely. The Company are not experiencing any difficulty in obtaining men to take the place of the strikers, and have been able to maintain a sufficient output of gas to provide for lighting the city. The support of the Government officials is stated to have been very satisfactory.

Public Lighting of Nuneaton.—It was reported some weeks ago that the Nuneaton Gas Company had announced their intention of making an increase in the charge for the public lamps of 10s. each (bringing the figure to £3 12s. 6d.), but that, after a suggestion had been made that the use of the Corporation electricity should be extended, the Company had re-opened negotiations. A Sub-Committee were appointed to interview the Manager (Mr. George Helps); and after much discussion, he agreed, on behalf of the Company, to accept the old figure of £3 2s. 6d. per lamp on a seven years' agreement. This it was recommended should be accepted; the Committee thinking it would not be wise at present to substitute electricity for gas, as "electricity was still in its infancy, and new lamps were continually being brought out." The Council decided that they would be willing to enter into an agreement with the Company for five years.

Public Lighting of Torquay.—A statement respecting the cost of public lighting was made by Mr. E. Pike, the Chairman of the Works and Highway Committee, at the meeting of the Torquay Town Council last Tuesday. The number of gas-lamps is 854. In the year ending March, £1096 was paid for gas in the old borough (the district served by the Torquay Gas Company), the total cost of ordinary lamps being £2 3s. 9¾d. each per annum; while in the St. Mary Church district the cost is £2 9s. 6¾d. For incandescent lamps, the average cost was £2 12s. in the old borough, and £3 1s. in the St. Mary Church area. The total cost of public lighting was £3615, of which £2365 was for gas lighting and £1250 for electric lighting. Mr. Pike added that he had compared the cost of public lighting in Torquay with that of 67 other towns, and had come to the conclusion that it was economically carried out. All new lamps put in in future would be incandescent.

Street Lighting of Biddulph.—The Congleton Corporation having been asked by the Biddulph Urban District Council whether they would consider the question of lighting the streets at Biddulph, Mr. J. Smith, the Gas Manager, on their behalf, pointed out that, as the revenue from street lighting alone could not possibly be sufficient to cover the initial outlay, he had advised his Committee that parliamentary powers should be obtained to supply the district. He asked if the Biddulph Council would be agreeable to the following proposals, providing that a satisfactory basis of charges was eventually agreed upon: (1) To support the application for a Provisional Order to supply the area; and (2) to allow the insertion of a clause for supplying the gas for a stated period of years, after which the rights may be purchased on the usual terms of settlement. The matter was discussed; and it was resolved that if the Council ultimately decided to have a supply of gas from Congleton they would support the application of the Corporation for a Provisional Order. The Surveyor reported that he had been in communication with the British Gaslight Company, in respect to the street lighting in Biddulph; but before the Company could submit any proposals to the Council, certain information was required.

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Assessment of Cheshire Water-Works.—At the Chester Quarter Sessions last Wednesday, judgment was given in an appeal by the Middlewich Urban District Council against an assessment of £744 by the Assessment Committee of the Northwich Union in respect of the water-works at Delamere and Kinderton, erected at a total cost of £27,000, and for which the appellants put down £180 as its estimate of assessment. The Court, in fixing the amount at £547—£147 in respect of Kinderton and £400 for Delamere—ordered both the parties to pay their own costs. The Bench agreed that the correct basis of assessment, as the respondents contended, was the structural cost; but they said that in the case of Kinderton the assessment was very much higher than any hypothetical tenant would be willing to pay—the works being now no longer absolutely necessary in their entirety for the purposes of the Urban District Council.

Subject to the audit of the accounts, the Directors of the Imperial Continental Gas Association propose a dividend of 4 per cent. for the past half year.

According to the "Middlesex Advertiser," the Rickmansworth District Council have decided to pay bonuses to the stokers employed at their gas-works.

Messrs. Biggs, Wall, and Co. have been successful in obtaining contracts for their methane-hydrogen gas plants at Amiens and Versailles, as well as at Bromsgrove.

The Directors of the Oriental Gas Company, Limited, have resolved to pay an interim dividend at the rate of 3½ per cent., free of income-tax, on account of the year ending June 30 next; being at the same rate as last year.

There was a very destructive conflagration at Fermoy in the early part of last week; and it is reported that as the Manager of the Gas Company was unable to obtain permission from the Urban District Council to cut off the gas at the main, he opened the road without leave and disconnected the service.

We have received a pamphlet bearing the title of "The Progress of Electric Telpherage," by Professor Emile Guarini, illustrating, in 24 pages, a number of applications of electricity to the transport of material. It is published by MM. Dunod et Pinat, No. 49, Quai des Grands-Augustins, Paris, at the price of 2 frs.

The Silsden Urban District Council have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a 60 ft. by 20 ft. single-lift spiral-guided gasholder, prepared for telescoping.

The appeal of the Manchester Corporation against the assessment of a portion of the Thirlmere Water-Works in the Cockermouth Union, was down for hearing at the Cumberland Quarter Sessions at Carlisle last week; but, in compliance with an application, the hearing was further adjourned to next sessions.

At the meeting of the Torquay Town Council last Tuesday, the tender of Messrs. Willey and Co., of Exeter, for £3698 (being the lowest of twelve), for the new gasholder at the St. Mary Church Gas-Works, was accepted, subject to the consent of the Local Government Board being obtained to a loan for the purpose.

We have received from Messrs. Falk, Stadelmann, and Co., Limited, their new revised catalogue (No. 267) of acetylene gas fittings and accessories. It consists of 80 large quarto pages, in which are illustrated a great variety of brackets, pendants, table and harp lamps, &c. On p. 61 is shown their "La Belle" patent stoves for acetylene, which are constructed to burn at low pressure.

The Executive of the Bolton and District Gas Workers' Association are dissatisfied with the terms and conditions of labour drawn up for the hoist men employed at the gas-works, and have asked the Gas Committee to receive a deputation on the subject. A communication has been received by the Secretary to the men's Association from the Gas Committee, expressing the opinion that in the first place a conference on the subject should be held by representatives of the workmen with the Gas Engineer.

A question has for a long time been open between the Aspatria, Silloth, and District Joint Water Board and the Wigton Rural District Council, as to whether the Board or the Council should lay the mains in the parishes outside the contributary area, but scheduled in the Water Board's Act. The Board have now offered to supply water in bulk for the parishes of Allonby and Westnewton at 8d. per 1000 gallons, for a minimum daily supply of 8000 gallons. This is a considerable reduction upon previous offers; and it has been accepted by the Wigton Rural Council, whose Clerk has been directed to apply for sanction to borrow £1700, which the water-works for the two parishes in question are estimated to cost.

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No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."
No. 7.—"The Osram Lamp: Fiction and Fact."

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

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ENGINEER (COKE-OVEN BUILDERS, &c.). No. 4923.
RETORT FOREMAN. Radcliffe Gas-Works.

Situations Wanted.
ENGINEER AND DRAUGHTSMAN. No. 4931.

Books (Second-Hand) for Sale.
JOURNAL VOLS., KING'S TREATISE, &c. No. 4933.

Plant (Second-Hand) Wanted.
PURIFIER. No. 4932.

Plant, &c. (Second-Hand) for Sale.
PURIFIERS, SCRUBBERS, ENGINES AND EXHAUSTERS, BOILERS, RETORT-BENCH MOUNTINGS, &c. British Gaslight Company, Etruria. Tenders by April 30.
RETORT-HOUSE PLANT, CONDENSERS, PURIFIERS, WASHER, ENGINE, EXHAUSTERS, STATION METER, &c. Aberavon Gas Department. Tenders by May 14.

Licences to Work Under Patent.
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ASCOT GAS AND ELECTRICITY COMPANY. April 29.
UXBRIDGE GAS COMPANY. April 23.

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Company Meeting.
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